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FIELD BRIEFING ON TORNADO PREDICTION AND PREPAREDNESS IN THE CAROLINAS DURING THE SEVERE WEATHER OF MARCH 28, 1984

BRIEFING

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES,
AGRICULTURE RESEARCH AND ENVIRONMENT

OF THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

NINETY-EIGHTH CONGRESS

SECOND SESSION

OCTOBER 18, 1984

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June 25, 1985

The Honorable Don Fuqua
Chairman, House Committee
on Science and Technology

The Honorable James H. Scheuer
Chairman, Subcommittee on
Natural Resources, Agriculture Research
and the Environment

Gentlemen:

March 24, 1984 will be long-remembered in North Carolina as the day of the worst tornadoes in the southeastern United States in 60 years. On that day, tornadoes swept through North and South Carolina that claimed 59 lives and caused hundreds of millions of dollars in damages. The tornadoes then weakened and moved up the eastern seaboard, regaining enough strength to strike inland once again, this time, claiming 10 more lives and causing additional heavy damages through flooding, heavy snowfall, and considerable beach erosion.

These tornadoes were a personal disaster for the many thousands of people whose properties were destroyed and who, unfortunately, lost loved ones. Many of the communities hit by the tornadoes were left totally devastated. And, for the first time, I witnessed the personal devastation and the feelings of hopelessness that engulfed so many of my constituents.

In response to this massive toll left by the tornadoes, the Subcommittee on Natural Resources, Agriculture Research and the Environment of the House Committee on Science and Technology, held a hearing in Rocky Mount, North Carolina on October 18, 1984, to ascertain more about the tornado phenomenon; federal, state and local response programs; and the special problems any community faces in the wake of such disaster. The hearing focused on the effectiveness of the National Weather Service (NWS) operations during the tornadoes and issues associated with tornado predictions and emergency preparedness. Additionally, the hearing reviewed the extent of damages and destruction caused by the 1984 storm; reviewed the findings and recommendations of the National Disaster Survey Report and the NWS response to that report; and examined the role of federal, state and local officials for greater coordination and cooperation during the presence of severe weather outbreaks.

Several issues of prime importance to public safety and health were revealed and discussed during the hearing such as the adequacy of storm forecasting; the adequacy of communicating accurately weather information; and the adequacy of community preparedness. In addressing these issues, witnesses identified several areas where improved technology was needed, more or better allocated staffing, or the use of different procedures which could have saved lives. To have an effective network, a well-integrated approach to all three components is essential. Of these components, however, the communication of adequate forecasts to appropriate information networks and linkages and to appropriate preparedness officials are paramount to its basic survival.

The first finding and recommendation to be reported by the Survey Team was that of a breakdown in communications of weather information between the NWS, the media, local officials and the public that resulted from a lack of preparedness activities. Secondly, due to several staff vacancies within the Weather Service, including that of a warning/preparedness meteorologist, coordination with the media outside the Raleigh area was characterized at best as being poor. The duties of informing outlying counties is usually that of the warning/preparedness meteorologist. I understand a meteorologist has been placed full-time at the Raleigh-Durham Airport and I cannot overemphasize my full support for this addition.

During severe storm outbreaks in South Carolina, a warning/preparedness meteorologist was present. Interestingly enough, the saving of many lives in South Carolina has been directly attributed to the presence of the meteorologist who knew what to do.

Another area of critical concern, Mr. Chairmen, is the NWS ability to forecast weather accurately with state-of-the-art technology. Again, the Survey Team recommended the continuation of procuring the 10-centimeter Doppler radar (NEXRAD) which should help in identifying storms with the potential of producing tornadoes. A lack of radar information regarding the tornadoes impaired the Weather Service's ability to provide any advance warnings. The Raleigh-Durham Airport uses the 5-centimeter local warning radar which is inadequate to track tornado-producing-supercells or distinguish between tornadoes and thunderstorms.

Finally, I would like to reiterate the vital importance for a well-coordinated local emergency preparedness network. The team that produced the NOAA report believes that community liaison activities of the local areas are the cornerstone of the NWS warning programs. These activities entail public education, recruiting and training of volunteer storm spotters, and developing connections for the dissemination of weather information to the media and to state and local officials.

I am enclosing the complete testimony from our hearing and the summary of the hearing completed by the Congressional Research Service. It is my hope that this report will assist Federal, state and local officials to identify the issues that must be addressed during severe weather emergencies.

In closing, I want to thank each of you for the enthusiastic and unwavering support you gave me as I investigated the issues raised by tornado emergencies. Special gratitude also goes to those individuals who gave generously of their time and effort to make this hearing successful.

Cordially,

Tim Valentine

Tim Valentine

TV/rds

Enclosures

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SUMMARY OF HEARING ON THE CAROLINA TORNADOES OF MARCH 28, 1984

David W. Cheney
Analyst in Science and Technology
and
Robert E. Morrison
Specialist in Marine Science
Science Policy Research Division
April 12, 1985

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I. INTRODUCTION

On March 28, 1984, the worst tornado event in the southeastern United States in 60 years claimed 59 lives and caused hundreds of millions of dollars in damages in North and South Carolina. The storm that spawned these tornadoes in the Carolinas then moved up the eastern seaboard and intensified again, taking another 10 lives and causing additional damage through flooding, heavy snowfall, and beach erosion.

Details of these severe weather events, a meteorological analysis of the weather system which spawned them, and a discussion of the forecasting of the events are reported in the July 1984 Natural Disaster Survey Report to the Administrator of the National Oceanic and Atmospheric Administration (NOAA), the parent agency of the National Weather Service. The Natural Disaster Report includes findings and recommendations in 11 specific areas for improving the forecasting of such severe weather events in the Carolinas, in particular, and in other parts of the country in general. 1/

The hearing by the Subcommittee on Natural Resources, Agriculture Research and Environment of the Committee on Science and Technology, held

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1/ Schneider, Eric D. (Team Leader), and Disaster Survey Team Members. Natural Disaster Survey Report to the Administrator of the National Oceanic and Atmospheric Administration: Carolina Tornadoes and Northeast Coastal Storm of March 28, 1984. Washington, D.C., July 1984. 30 p. (This report is included as part of the record of the October 18, 1984, hearing on the Carolina tornadoes, conducted by the Subcommittee on Natural Resources, Agriculture Research and Environment, House Committee on Science and Technology.)

October 18, 1984, in Rocky Mount, North Carolina, was intended to (1) review the extent of damage and destruction caused in the Carolinas by the March 28, 1984, storms; (2) review the performance of the National Weather Service in preparing communities for severe weather, in predicting the March 28 storms, and in communicating information concerning the storms; (3) review the findings and recommendations of the July 1984 Natural Disaster Survey Report submitted to the NOAA Administrator on the severe weather of March 28, 1984; (4) review the adequacy of the National Weather Service response to the Natural Disaster Survey Report; and (5) examine the necessity for greater coordination and cooperation between local, State, and Federal officials and the media during the presence of severe weather outbreaks.

This summary includes a discussion of some general background on tornadoes and on tornado prediction by the National Weather Service as well as a synopsis of the testimony from the several witnesses at the October 18, 1984, hearing. Information and opinions from these witnesses on the issues stated above, as well as related ones, were provided to the subcommittee through prepared statements, oral testimony, and responses to specific questions.

II. TORNADOES AND TORNADO PREDICTION

A. BACKGROUND ON TORNADOES

Tornadoes occur in various parts of the world, but both the greatest number and the most severe tornadoes are produced in the United States. Their origins here can be traced to severe thunderstorms, formed when warm, moisture-laden air sweeping in from the Gulf of Mexico meets cooler, continental air flowing from the west or northwest. Some of these thunderstorms are characterized by the violent updrafts and strong tangential winds which spawn tornadoes, though the details of tornado generation are still not fully understood.

Tornadoes--violently rotating columns of air suspended from cumulonimbus clouds--begin as funnel-shaped extensions from the clouds and build downward to the ground and darken as they pick up debris. On a local scale, tornadoes are the most destructive of all atmospheric phenomena. Horizontal wind speed near the center of a tornado may exceed 300 miles per hour; and the ground speed, usually 25 to 40 miles per hour, can range from nearly stationary to nearly 70 miles per hour. Paths of tornadoes can range in length from a few miles to several hundred miles and in breadth from a hundred yards to a few miles. In the United States they generally move in a southwest to northeast direction. Tornadoes are most prevalent in the spring and occur over much of the eastern two-thirds of the United States, with the highest frequency and greatest devastation experienced in the States of the Middle South and the Middle West. Each year about 600 tornadoes are reported in the United States. They usually form during the middle or late afternoon, the hours between 3 and 7 p.m. being the most likely period.

B. TORNADO PREDICTION AND THE NATIONAL WEATHER SERVICE

Not only are tornadoes only partially understood; they are also difficult to predict, owing to their rapid formation, short lifetime, and relatively small size. When meteorological conditions in a region are such that formation of tornadoes is possible, a "tornado watch" is issued by the National Weather Service (NWS); when a tornado has been spotted or has been observed on weather radar, the NWS issues a "tornado warning."

The NWS has statutory responsibility for providing a Severe Local Storms and Warning Service (including tornadoes) for all 50 States. This Watch and Warning Service is available to the general public and to aviation and is provided by the NWS through its National Severe Storms Forecast Center (NSSFC) at Kansas City, Weather Service Forecast Offices (WSFOs), and Weather Service Offices (WSOs). In the 48 conterminous States the NSSFC is responsible for issuing and cancelling severe thunderstorm and tornado watches and for alerting local forecast offices (WSFOs) to areas of high potential for severe weather development. Local offices, in turn, issue warnings based on actual sightings of tornadoes or on radar signatures. The WSFOs and WSOs are responsible for informing the general public of potential severe weather, redefining the NSSFC statements for those parts of the States likely to be affected. When warnings are given, they are identified as either a tornado warning or a severe thunderstorm warning.

Weather radar is an essential tool in forecasting severe weather from which tornadoes can be generated and in spotting actual occurrences of tornadoes. Radar data, available from the U.S. Basic Weather Radar Network (composed of NWS radars, U.S. Air Force weather radars, and air route traffic control radars), are used routinely in the preparation of NSSFC products.

In addition, the NWS, the Air Force, and the Navy operate a number of non-network radars, used primarily for local forecasting and warning and to provide selected information on severe storms. A planned national system of Doppler radars, being developed under a joint program of the Departments of Commerce, Defense, and Transportation--the Next Generation Weather Radar (NEXRAD)--is expected to allow more accurate and more highly focussed tornado forecasts, owing to its capability of measuring wind velocities within and around tornadoes.

In addition to radar information and satellite data (obtained through NOAA's National Environmental Satellite, Data, and Information Service), basic meteorological data required for NSSFC analyses include those obtained from the surface weather observational network, from rawinsonde (upper air measurement) stations, and from pilot reports of weather hazardous to aviation. The NWS also uses observations of severe local weather, especially tornadoes, from citizen spotter networks, State highway patrols and local police departments, local Civil Defense organizations, cooperative NWS climatological observers, radio and television mobile units, and many other employees of local governments and individual citizens. These reports are received by various means and are not uniform at the various WSOs.

The principal NWS/NOAA systems for collecting and dissemination of weather information are the Automation and Field Operations (AFOS), the Radar Report (RAREP) and Warning Coordination Circuit (RAWARC), the NOAA Weather Wire Service (NWWS), and NOAA Weather Radio. The purpose of the NWWS is to transmit consumer-oriented forecasts, watches, warnings, and meteorological data to the mass media for broadcast to the public. WSFOs and WSOs equipped with NOAA Weather Radio can transmit weather information continuously to an area of about

40 miles radius; a tonal alert capability is used to activate specially designed NOAA Radio receivers during severe weather conditions.

In addition, at a time of weather emergency, the National Warning System (NAWAS), operated by the Federal Emergency Management Agency (FEMA), can be employed. NAWAS is a hot-line interstate telephone system, which connects FEMA warning points with WSFOs, WSOs, and Weather Service Meteorological Observatories (WSMOs) within each State and between States. The Emergency Broadcast System (EBS) can also be activated for all tornado warnings. Since EBS is used at the discretion of individual radio and television stations, arrangements for its use are made prior to the severe local storm season or may be based on a continuing agreement.

Beside developing and issuing weather reports, the NWS provides other services which involve technical assistance, advice, and consultation. Disaster preparedness assistance is designed to improve the response by community officials and the public to forecasts and warnings. Within available resources, such assistance is carried out by WSOs and warning preparedness meteorologists assigned to some WSFOs, primarily in the Eastern, Midwestern, and Southern States. This NWS effort is coordinated at all levels with FEMA through a formal NOAA-FEMA Memorandum of Understanding.

III. SUMMARY OF TESTIMONY

The remainder of this report summarizes the testimony and written statements at the October 18, 1984, hearing that pertain to the performance of the National Weather Service (NWS) before, during, and after the March 28, 1984, Carolina tornadoes. The point of reference for many of the comments at the hearing was the Disaster Survey Report to the Administrator of NOAA. The subject of that report was essentially the same as the subject of the hearing, where most of the testimony confirmed the conclusions of the NOAA report and reflected a broad consensus on both the successes and shortcomings of NWS in the disaster. This is not surprising in view of the fact that some of the witnesses were interviewed in the process of preparing the report. Some witnesses added to or expanded upon the conclusions of the report, and a few took issue with certain parts of the report.

The NOAA report and testimony at the hearing primarily addressed the following: (1) the adequacy of the storm forecasts prior to the tornadoes; (2) the adequacy of the communication of weather information to the media, public, and Government officials; and (3) the adequacy of the community preparedness activities of NWS prior to the storm. In addressing these issues, witnesses identified several areas where improved technology, more or better-allocated staffing, or different procedures could have possibly saved lives.

A. ADEQUACY OF STORM FORECASTING ON MARCH 28, 1984

The Weather Service's warning system for thunderstorms and tornadoes is in two parts. At the national level, the National Severe Storms Forecast Center (NSSFC) in Kansas City issues long-range, area-wide forecasts and issues "watches" that indicate that there is the potential for severe storms to develop. At the State level, Weather Service Forecast Offices (WSFOs) make local forecasts and issue "warnings" when the severe weather phenomenon has been verified to have occurred. The consensus at the hearing was that long-range storm watches issued by the NSSFC at Kansas City, were, in the words of the NOAA report, "superbly accurate" but that the issuance of warnings, particularly tornado warnings, was inadequate.

1. Adequacy of Long-Range Forecasts

The long-range forecasts were based on satellite information and computer models at the Kansas City center. The NSSFC described a moderate risk of severe thunderstorms early on the morning of March 28th and issued its first tornado watch at 11:58 a.m. for northern and central Alabama and Georgia. Shortly after 2 p.m., the Center issued an expanded tornado watch that covered portions of Alabama, Georgia, South Carolina, North Carolina, and Virginia. This watch was issued for an unusually long time--7 hours. The advance warning enabled the local Weather Service offices to bring in extra people for the night.

While most witnesses agreed that the long-range forecasts were excellent, several witnesses made additional comments. Greg Fishell of WRAL-TV in Raleigh noted that the NWS WSFO at the Raleigh-Durham airport waited a long time before mentioning the possibility of severe weather. He said his TV station mentioned the possibility of a storm 36 hours in advance and that meteorologists were in agreement about the possibility of a killer storm 24 hours in advance, but that the Raleigh-Durham office did not mention the threat until 11 a.m. on the day of the tornadoes. He also stated that, although the first watch issued (for Alabama and Georgia) contained wording indicating that the storms were particularly dangerous, the subsequent watch for the Carolinas did not contain this wording.

Brian Brantley, the Coordinator of Edgecombe-Nash Emergency Management Agency, complimented the NWS on its long lead time for tornado watches but said that his agency did not receive any subsequent updates. The NOAA report said that the Weather Service intentionally issued its watches for an abnormally long time because they did not want to have to reissue watches when the storm was actually in progress.

2. Adequacy of Short-Term Warnings

There was much more criticism of the issuance of tornado warnings by the local NWS offices. For many of the counties struck by tornadoes, tornado warnings were never issued or were provided with so little lead time that they were of little use. Several of the problems identified were: (1) the inappropriateness of the watch/warning classification for tornadoes; (2) inadequate radar technology; and (3) the lack of an adequate network of trained "spotters."

a. Appropriateness of the Watch/Warning Classification for Tornadoes

Numerous witnesses noted that the tornado watch/warning designation was inappropriate for providing adequate warning to the public. A "watch" means that conditions are conducive for a tornado to develop while a "warning" means that a tornado has been identified. The criticism of this designation is twofold. First, "watch" does not imply an adequate sense of urgency on the part of the public. Second, by the time a "watch" is upgraded to "warning" the tornado may have already caused destruction and it might be too late for people to protect themselves. Some witnesses commented that the watch/warning designation may be appropriate for storms that either develop slowly, such as hurricanes, or are less lethal, such as thunderstorms, but that it is inappropriate for tornadoes, which are both unpredictable and lethal. The rigid requirements for upgrading a watch to a warning may have prevented the weather service from adequately conveying the seriousness of the storms.

b. Adequacy of Radar

The NOAA report concluded that "[M]uch of the time local warning radar was of marginal value in indicating tornadoes or identifying the supercell that produced tornadoes in both States." Specifically, the report noted the weather service radar system contained 10-centimeter network coastal radars at Wilmington and Cape Hatteras, N.C., and Charleston, S.C., and 5-centimeter local warning radars at Columbia, S.C., and Raleigh, N.C. Most of the warnings were made by the 5-centimeter local warning radars, which were inadequate to track the tornado-producing supercells or distinguish between tornadoes and thunderstorms. The report recommended continuing procurement of the 10-centimeter Doppler radar (NEXRAD Program), which the report said should help to identify storms with the potential for producing tornadoes. Another problem was that the 5-centimeter radar network was not compatible with the 10-centimeter network, and the report recommended that the offices with local warning radar be equipped with displays from the adjacent network radars that cover their areas.

Many other witnesses substantiated and augmented these criticisms and suggestions. The lack of radar information to indentify tornado-producing supercells contributed to the Weather Service's inability to provide any advance warning of tornadoes. As a result, the Weather Service often issued only Severe Storm Warnings instead of Tornado Warnings, and many of the warnings were issued after the tornadoes had already struck. Witnesses commented that a Severe Storm Warning does not convey nearly the same degree of seriousness as a Tornado Warning.

Andy Park of WTVD said that, in some cases, television weather centers have radar technology superior to that of the NWS and that there needs to be more cooperation between the two. He cited a Minnesota television station that has used a Doppler radar in advance of such contemplated use by the Weather Service.

c. Adequacy of the Spotter Network

Weather spotters are volunteers who report to the NWS sightings of tornadoes or other severe storms. They are used to identify tornadoes positively and allow the Weather Service to upgrade a "watch" to a "warning." The NOAA report noted that tornado spotters and amateur radio operators played a major role in relaying reports from northeastern South Carolina, but could find no evidence of a severe storm reporting network in other parts of North or South Carolina. This compounded the problem of inadequate radar, and the Weather Service was unable to upgrade their severe weather warnings to tornado warnings due to the lack of positive evidence. The NOAA report recommended a prompt effort to recruit, establish, and formalize such networks. The lack of a spotter and amateur radio network was partially blamed on staffing problems at the Raleigh WSFO with resulting lack of staff time devoted to community liaison activities. This is discussed in further detail below.

B. ADEQUACY OF COMMUNICATIONS TO THE MEDIA, PUBLIC, AND GOVERNMENT OFFICIALS

The NOAA report and the hearing revealed that the communication of weather information from the Weather Service to the media and public was not entirely adequate. The primary channel that NWS uses to communicate with the public is the NOAA Weather Wire Service (NWWS), a teletype system, which failed when a microwave transmission tower was knocked out by a tornado as the storm entered North Carolina. The back-up channels used after the failure of the NOAA Weather Wire included the NOAA Weather Radio, telephone communications with the media, the Emergency Broadcast System, the National Warning System, and amateur radio operators. All of these channels were found to have some inadequacies, and several suggestions were made for improving the communication of weather information to the public.

1. NOAA Weather Wire Service

The NOAA report concluded that the NOAA Weather Wire was "the key link to the news media and hence to the general public." When the tornado knocked out the microwave tower in North Carolina, it knocked out the Weather Wire for the whole State and compromised the complete warning/communication system for North Carolina. The NOAA report recommended that the use of back up systems should be explored.

When the Weather Wire went down, the people at the WFSO at the Raleigh/Durham airport telephoned weather information to one of the major television stations in the area. However, they did not relay the information to a second major station because the Weather Service did not have the correct telephone numbers on hand. Dr. Elbert Friday, Deputy Director of the NWS, testified that with a warning/preparedness meteorologist in North Carolina this mix-up would not reoccur. The NOAA report and Greg Fishel of WRAL-TV (the station to which the NWS relayed its weather information) were complimentary to the Weather Service's efforts to inform the media when the Weather Wire failed. The stations that were not called by the Weather Service were more critical of these efforts.

2. NOAA Weather Radio

The NOAA report found that the NOAA Weather Radio was an excellent backup to the NOAA Weather Wire and was also a means for people to receive weather information directly from the Weather Service. However, the report noted that a large segment of the public was unaware of the existence or the usefulness of NOAA Weather Radio, and that some areas of the Carolinas could not receive Weather Radio transmissions. The report recommended redoubled efforts to publicize the value of NOAA Weather Radio and recommended eliminating gaps in its coverage. Andy Park of WTVD noted that most people do not have radios that can receive the NOAA Weather Radio. He also noted that the television stations have a much greater broadcast area than NOAA Weather Radio and that his station's studio could not receive Weather Radio forecasts for all of the areas reached by their television broadcast. In particular, their studio could not get information from the Weather Radio for the areas that were hit by tornadoes. Brian Brantley of the Nash-Edgecombe Emergency Management Agency commented that he found NOAA Weather Radio to be very useful, but that sometimes the information on it was not updated frequently enough. Jack Roper, of WITN-TV also said that bad reception was a problem with NOAA Weather Radio.

3. National Warning System and Emergency Broadcast System

The NOAA report noted that the FEMA-run National Warning System (NAWAS), a voice circuit (like a large party telephone line) that interconnects with emergency management and law enforcement agencies, was used extensively by the WSFOs for the dissemination of warnings to government officials. However, they did not use the system for soliciting information or reports of damages. The NOAA report recommended that the NAWAS system also be used for soliciting reports of damages from local emergency and law enforcement agencies, and that the Raleigh and Columbia WSFOs should make the appropriate arrangements with their State emergency management agencies. Jack Roper of WITN-TV also suggested that the media could be hooked into NAWAS.

Another communication system is the Emergency Broadcast System (EBS) which provides communication between government officials and the media during emergencies. Andy Park of WTVD noted that NWS offices in some areas of the country use this system to alert the broadcast media to the existence of a warning. The media then contact the Weather Service office through an unlisted telephone line. But, he noted that telephone numbers for the Raleigh WSFO were not disseminated to the media until after the NOAA report came out, long after the March 28 tornadoes.

Jesse Pugh, Director of the Division of Emergency Management of the North Carolina Department of Crime Control and Public Safety, said the Emergency

Broadast System was not adequately supported by the Federal Government and needs improvement. He recommended that participation in the EBS, which is currently voluntary, should be mandated by the Federal Communications Commission. He also complained that FEMA's only interests in the program seemed to be in hardening the system against nuclear blasts and said that money would be better spent on auxiliary power for the EBS system and in strengthening connections between the broadcast media and the EBS system.

4. Other Communications

a. Amateur Radio Operators

The NOAA report noted that amateur radio networks can be useful in both getting information from tornado spotters to the NWS and as a backup means of getting information from the Weather Service to the media or the public. The NOAA report found that the amateur radio networks were well developed and very useful in the northeast part of South Carolina, but were insufficiently developed in North Carolina, in part due to the lack of a warning/preparedness meteorologist. Jesse Pugh pointed out that amateur radio operators played a vital part in the emergency actions in North Carolina following the tornadoes and said that they also assisted in spotting tornadoes.

b. Telephone

Another communication system used was the telephone. As described previously, the Raleigh WSFO succeeded in getting information via telephone to one "flagship" station, but did not succeed in getting information to other stations because they did not have the correct telephone numbers.

Andy Park of WTVD also noted that some NWS offices use a "hot line" that rings in all media and other user offices when activated at the Weather Service office. The Weather Service can then notify all the media simultaneously of serious weather. This type of system was not used in North Carolina. Jack Roper of WITN-TV also suggested using Associate Press and United Press International as backups for the NOAA Weather Wire.

C. ADEQUACY OF NWS PREPAREDNESS ACTIVITIES

As described previously, many of the problems in issuing warnings and in disseminating weather information to the public resulted from the lack of a warning/preparedness meteorologist to develop spotter and amateur radio networks and to develop liaisons between the Weather Service and local media and government agencies.

The first finding and recommendation of the NOAA report and the subject on which there was the greatest degree of consensus at the hearing was that there were breakdowns in the communication between the NWS, the media, and the public that resulted from a lack of preparedness activities. The team that produced the NOAA report believed that the community liaison activities of the local areas are the cornerstone of the NWS warning program. These activities entail public education, recruiting and training of volunteer storm spotters and developing connections for the dissemination of weather information to the media and to State and local officials.

The NOAA report noted that North Carolina had never had a warning/preparedness meteorologist and had been carrying other staff vacancies. As a result, the NOAA report found that links between the Raleigh WSFO to county and city emergency agencies and to TV and radio stations in the areas affected by the March 28 storms were inadequate. Coordination with the media in Raleigh was satisfactory but coordination with the media in outlying counties, which is usually the job of a warning/preparedness meteorologist, was poor. The report also stated that there is evidence that similar situations exist elsewhere in the United States. Among the consequences of the lack of community preparedness activities were the lack of a spotter network for reporting tornadoes, and the lack of adequate dissemination of weather information to the media.

By contrast, Mr. Jim Campbell of the NWS Severe Storms Office in Washington, D.C., testified that in communities such as Bennettsville, South Carolina, where there had been a warning/preparedness meteorologist, lives were saved partly due to community preparation and to a tornado awareness week held shortly before the tornadoes. It was cited that, by the time the hearing was held, North Carolina had been given an additional position for a warning/preparedness meteorologist, and recruitment was under way for filling that position.

FIELD BRIEFING ON TORNADO PREDICTION AND PREPAREDNESS IN THE CAROLINAS DURING THE SEVERE WEATHER OF MARCH 28, 1984

THURSDAY, OCTOBER 18, 1984

House of Representatives,
Committee on Science and Technology,
Subcommittee on Natural Resources,
Agriculture Research and Environment,
Rocky Mount, NC.

The subcommittee met, pursuant to call, at 10:15 a.m., city council chamber, Rocky Mount, NC, Hon. James H. Scheuer (chairman of the subcommittee) presiding.

Mr. Scheuer. I'm chairman of the NRARE Subcommittee. Incidentally, I suppose I ought to say for the record that this session is now in order.

This subcommittee is in charge of natural resources, agricultural research and environment, and under the environment rubric, we have jurisdiction over all aspects of climate and weather. We have jurisdiction over the Environmental Protection Administration, over NOAA, the National Agri—the National Oceanic and Atmospheric Administration. We consider such climate-related items as the greenhouse effect, as desertification, deforestation, loss of species due to erosion or rain forests, and all kinds of weather and climate phenomenon that have not only national, but global significance. And among the members who have worked hard in our committee, none has worked more hard or more diligently than Tim Valentine.

This is the 10th hearing that we have had around the country on various aspects of the Weather Service, which is—which, as you know, has stretched to the breaking point—the 10th one. And Tim Valentine felt that, especially since you had had such a—such an experience with very severe weather on March 28 of this year, that it would be appropriate to review the bidding, so to speak, and evaluate the performance of the Weather Service in this community that had such a critical experience, let us say, with severe weather in March of this year.

So, since Tim has taken much of the leadership in this committee and has worked so diligently and has mastered the subjects so effectively, I'm going to ask him to take the responsibility for chairing this hearing. Tim.

Mr. Valentine [presiding]. Thank you very much, Mr. Chairman.

I want to at the outset say to my good friend Fred Turnage that we are grateful to him and his staff and other city officials for the spirit of cooperation. And I want to say to him also that I am especially proud to be at home on this occasion. We—I'm not going to claim that we built this building just for this purpose, Mr. Chairman, but I certainly am glad that it's here for you to see rather than what preceded.

I can't help but mention the fact that when the mayor talks about the fact that it is here and that it's paid for, that he told me that it was part of the funds that went to pay for this outstanding facility came from Federal revenue sharing.

Mr. Chairman, I'm grateful to you also for taking the time from a busy schedule to come and launch this hearing and otherwise being a part of it. I—you, as maybe some of our friends here don't realize, are a distinguished Member of the Congress from New York State, and you had to get up mighty early this morning to get to eastern North Carolina. I want to express to you, of course, my personal and official thanks.

I would like also to express my appreciation to the chairman of the full committee, Mr. Don Fuqua of the State of Florida, for encouraging the subcommittee to proceed with these hearings.

As the chairman mentioned to you, we had numerous other hearings, and we know from these previous hearings that the National Weather Service in this country is stretched to the breaking point. Funding has not kept up with inflation and Weather Service personnel levels have actually decreased by over 300 positions since 1970. These reductions are primarily—are particularly painful when one realizes that the satellite technology, the radar capability and the computing power are available now off the shelf with the potential for revolutionizing weather forecasting in this Nation.

Against this backdrop, the administration has in the past 2 years advanced a number of proposals which would result in radical changes in the operation of the National Weather Service. One is the proposal to sell the Nation's four weather satellites to the private sector; another is the proposal to contract out many positions—many—portions or parts of the National Weather Service to the lowest bidder; and the third proposition is to close many local weather stations and to eliminate many traditional services, such as agriculture weather services which are particularly significant to this area.

Our subcommittee, under Chairman Scheuer, which has responsibility for the budget of the National Weather Service, has heard voluminous testimony over the past year on the merits and the demerits of these various proposals. And partly as a result of the record of these hearings, the Congress has reversed a number of these administration proposals. We have stopped the proposal to sell the Nation's weather satellites, which are the eyes and the ears of our observation system. We have slowed the wholesale contracting out of weather services so that we might soberly consider how best to bring our Weather Service into the 21st century. And today we will continue our oversight of weather services by examining how these services operated in response to the Carolina tornadoes of March 28, 1984.

The heavy rains and killer tornadoes which roared through North and South Carolina on March 28 constituted the worst disaster in the last century for these two States. On that day, 20 tornadoes were sighted. The storms, moving at a ground speed of 60 miles per hour, traveled more than 300 miles from Newberry, SC to Gates County, NC, and all this during a 4½ hour period, causing more than $200 million in damage, leaving 59 persons dead, and about 1,300 injured, and more than 3,000 people left homeless.

Even though a similar disaster occurred in South Carolina in 1944 and a single violent tornado struck Greensboro, NC in 1936, nothing comparable to the scale or violence of the March 28 tragedy has happened in over 100 years. We have to look all the way back to 1844 when a total of 60 tornadoes struck and devastated many Southeastern States in order to find a tragedy which approaches what happened earlier this year.

Today, about 7 months later, the effects of the killer tornadoes linger in the minds of hundreds of people who were directly affected by this tragedy. Many of the tornado victims still live in a state of limbo.

The job of rebuilding their lives and their homes and their communities has not been easy. Some homeowners and merchants are still waiting for the necessary finances to become available. And even the fortunate ones with the money in hand will face delays, serious delays, as they wait their turn with busy contractors. Although much of the debris has been cleared up and much of the rebuilding completed, the task of mending the hearts and minds of the victims of these tornadoes is more difficult.

The purpose of the hearing here in Rocky Mount today is to focus on the performance of the National Weather Service in warning the public about these tornadoes, the tornadoes which savagely struck both the Carolinas, and to try to find out what can be done to ensure that our people have adequate warnings in the future.

Shortly after the March 28 catastrophe, the National Oceanic and Atmospheric Administration, NOAA, which has jurisdiction over the National Weather Service, dispatched a disaster survey team to the Carolinas. This survey team issued an interim report which included a detailed account of the Carolina tornadoes and the weather service's ability, or lack of ability, to forecast timely warnings given certain budgetary constraints. The survey made specific recommendations to ensure an effective National Weather Service Community Warning Program throughout the Carolinas.

Further, I believe that detection of tornadoes and severe storm preparedness depends on a well-coordinated local emergency preparedness network. There is absolutely no substitute for such a network. There is such a well-established network in the Carolinas, and it served the citizens well during the tornadoes and continues to serve the citizens well.

The first of the 11 findings of the report illustrates this point clearly. While there is a serious staff shortage in both North and South Carolina, the staff situation is even more critical in this State, in the State of North Carolina. North Carolina is larger and the number of counties and weather offices is, of course, greater.

According to the report, there is a potentially explosive flash flood problem, for example, in North Carolina's western counties, a dangerous hurricane potential along the populated coastline, as well as the severe storm problem.

NOAA administrators have recommended that the staffs of both Weather Service forecast offices in North Carolina and South Carolina be augmented as soon as possible to ensure an effective National Weather Service community-based warning program throughout the two Carolinas. A dedicated warning/preparedness meteorologist would give essential focus to the program at Raleigh-Durham. With full staffing the warning/preparedness meteorologist could devote the time needed in distant counties.

We want to look very closely today at how well NOAA has implemented the recommendations of its July 1984 report.

And in conclusion, I would like to say again for the record that we appreciate the cooperation which we have received from local officials in putting all of this together. This is no small task to contact all of the people who might have thoughts and ideas on their minds that they would like to discuss with a congressional committee. It takes a lot of hard work to bring all of these details together in one place at one time. I want to, in addition to—thanks again to the city and the mayor—I want to thank the staff of this subcommittee and the full committee, some of whom are here today, for all the hard, difficult and effective work which they have done. And again express my appreciation to you, sir. You have honored us with your presence here.

The first witness is seated there and ready to go. And he is Mr. Thomas Wayne Horne, who is city manager of the city of Red Springs, NC. Mr. Horne, we are delighted to have you here. You, of course, may file your—the text of your testimony and give it to us in toto from the prepared statement or in summary or any way that you would care to proceed.

STATEMENT OF THOMAS WAYNE HORNE, CITY MANAGER, RED SPRINGS, NC

Mr. Horne. Thank you, Mr. Chairman.

If you look at my prepared statement, it also has with it a breakdown or summary of the costs that we've incurred. It also has a small map showing the path the tornado took through Red Springs, and also some pictures that were taken by local press showing the extent of damage.

What I would like to do with your permission is go through a small slide presentation at the same time that I go through my summary here.

Mr. Valentine. Yes, sir.

Mr. Horne. And we may have to dim some of the lights. I am not sure if the—Mr. Chairman, can you make that out? Is it too light?

Mr. Valentine. I wonder if we could—Mayor, can we—that's a light up there or a skylight, can we turn that off or down?

Mr. Horne. That's much better.

[Slide shown.]

Mr. Chairman, on the evening of March 28, the Town of Red Springs, with a population of 4,000 people, experienced the worst natural disaster in its history. Even though severe storm warnings and tornado watches were being flashed on local television stations, Red Springs was not anticipating tornadoes.

[Slide shown.]

For years, the residents of the town had witnessed severe storm warnings on television and had experienced nothing more than summer thunderstorms. They did not think that the evening of March 28 would be any different.

Mr. VALENTINE. Excuse me just a minute. I don't want to interfere with your normal presentation, but could you talk a little bit louder?

Mr. HORNE. Yes, sir.

Mr. VALENTINE. I don't know what—I don't believe we have any amplifying system in here, and I don't know whether these other people can hear you. If you could just raise your voice a little bit, please.

Mr. HORNE. As stated, severe storm warnings and tornado watches were being—were being flashed on local television, but for years, citizens of Red Springs had witnessed severe storm warnings on television and experienced nothing more than summer thunderstorms. They did not think that the evening of March 28 would be any different.

The picture that you are looking at here is Peterson Elementary School, which was completely destroyed as a result of the tornado, at an anticipated cost of $2.8 million to repair and replace the building.

[Slide shown.]

At approximately 7:38, tornadoes moving up from South Carolina would hit Red Springs on the northwestern edge of town, cross through the central business district and exit on the northeast side of town. The storm would leave 2 people dead and approximately 50 people injured.

[Slide shown.]

A tour of the town by its officials showed that 600 homes had received some damage, and this was by degrees, while scores had been destroyed. Many of the commercial buildings and churches, as well as the Presbyterian Elementary—Peterson Elementary School, received extensive damage. Approximately 1,000 trees were down throughout the community. These trees were over on homes and powerlines, blocking roads, creating a major problem.

[Slide shown.]

This is a 100-unit house—public housing project in the center of Red Springs, and the roofs of approximately half of these units were taken off as a result of the storm. An emergency situation was declared and a contingent of 250 National Guardsmen were called in to help seal off the affected area and a curfew was declared.

[Slide shown.]

The absence of electrical power and communications were major problems facing town officials. The town's water system was affected as a result of storm damage to two well houses. Emergency generators furnished by the National Guard were used to operate the water plant, wells, and sanitary sewer lift stations for a week—for approximately 1 week, until power could be restored. The town's public works complex received extensive damage with the garage building and equipment shelter building being completely destroyed.

[Slide shown.]

Coordination of cleanup effort and repairs to publicly owned facilities became the focal point of the town efforts. Outside crews rushed to Red Springs to work on the municipal electric system, natural gas lines, telephone lines, cablevision, and traffic signals. Red Springs officials were faced with what seemed an impossible job as hundreds of volunteers poured into the community to help with the cleanup. Detailing work assignments, working with the news media, and assigning the Corps of Engineers with damage assessment reports for the Federal Emergency Management Agency strained all of Red Springs' human resources.

[Slide shown.]

The damage to the town's electrical system was so severe that it took the 13 electrical crews from cities providing mutual aid to Red Springs 6 days to restore primary electrical service. It would take several more weeks before secondary service and individual home service could be restored. Not only was 40 percent of the distribution system downed, but the town's electrical substation was heavily damaged requiring temporary emergency repairs. In addition, hundreds of service connections and electrical meters were ripped from individual homes requiring owners to complete their repairs before the town could restore their power.

[Slide shown.]

The damage estimates for Red Springs' municipal facilities has exceeded $812,000. This includes the cost of debris cleanup, damage to municipal facilities, repairs to municipal utilities, and repairs to streets and curb and gutter.

[Slide shown.]

This was an individual home here that was completely destroyed. There was three people in the house and, very fortunately, no one was hurt. It did require some medical attention for one young girl for about 2 months, but all three survived.

The impact on the private sector included damage to private dwellings, businesses, and to properties other than publicly owned properties. The losses could exceed $9 million. Almost every building in the central business district received some damage. Roofs were either taken off or collapsed.

[Slide shown.]

The Western Auto Store, Pope's 5 & 10, Red Springs Cafeteria, and Grantham Insurance Agency, along with seven other businesses, were completely destroyed. Several of the businesses have relocated, two have rebuilt, and others had decided not to reopen, resulting in loss of jobs and income to Red Springs.

[Slide shown.]

The Flora McDonald College Building, which is listed on the National Register of Historical Property, received damage exceeding $400,000. The adjoining 6 acres of gardens, which are an important part of our community, were almost completely devastated. The damage to the gardens resulted in a loss of over $50,000 to the restoration group who had been working for the past 5 years to reestablish the gardens to their original state.

[Slide shown.]

Even though a major effort is being made to clean up—to clean up and rebuild Red Springs, damage inflicted on the town by the storm is still clearly evident 6 months later. Several businesses have closed in the downtown area as a result of the owner's decision not to repair or rebuild their buildings. Right now, Red Springs residents are just beginning the recovery process which may take several years. The town, in working through the State Emergency Community Development Program, has received 135 applications from persons in Red Springs claiming unmet needs as a result of tornado damage. The town is currently taking bids to repair and replace municipal facilities and equipment. There is still a long way to go, but the community is pulling together to do what needs to be done.

[Slide shown.]

The remaining pictures are pictures of—this is our central business district here, as you can see where—had extensive damage.

[Series of slides shown.]

This was the Western Auto Store I referenced earlier, and it was completely destroyed, and there was two people in this building also and both survived. We were very fortunate in that respect.

[Series of slides shown.]

Without the assistance that the cities received statewide, it would have taken years for Red Springs to rebuild.

[Slide shown.]

This is the First Presbyterian Church which received $900,000 worth of damage. They're in the process of restoring this church.

[Slide shown.]

The cost for removing—this is the Flora McDonald Gardens, which was mentioned earlier. Mr. Chairman, the cost of just removing stumps alone was over $60,000 from private property.

Before the storm, you could not see the buildings for the trees.

[Series of slides shown.]

This church here was having a Wednesday night prayer meeting. This is where two people were killed when the roof collapsed in the church, a young girl and an elderly man.

[Slide shown.]

This is our city water plant, and if you will notice, the National Guard had emergency generators on to keep it operating.

[Slide shown.]

In your report that you submitted to me—this is the microwave station at Maxton, NC that was taken out of service.

[Slide shown.]

Mr. Chairman, this concludes my report. I'll be glad to entertain any questions that you have.

[The prepared statement of Mr. Horne follows:]

RED SPRINGS, N. C.

On the evening of March 28, 1984, the Town of Red Springs, North Carolina, with a population of 4,000, experienced the worst natural disaster in its history. Even though severe storm warnings and tornado watches were being flashed on local television stations, Red Springs was not anticipating tornadoes. For years, residents of the Town had witnessed severe storm warnings on television and had experienced nothing more than summer thunderstorms; they did not think that the evening of March 28 would be any different. Just how unusual that night was to be would soon become very evident.

At approximately 7:28 P.M., tornadoes moving up from South Carolina would hit Red Springs on the southwestern edge of Town, cross through the central business district and exit on the northeast side of Town. The storm would leave two people dead and approximately fifty people injured.

A tour of the Town by its officials showed that six hundred homes had received some damage, while scores had been destroyed. Many of the commercial buildings and churches as well as the Peterson Elementary School had received extensive damage. Repair expenses for the First Presbyterian Church would exceed $900,000 while the elementary school replacement cost would be $2,800,000. An estimated 1,000 trees were down throughout town, blocking streets, damaging houses and interfering with electrical service.

An emergency situation was declared and a contingent of 250 National Guardsmen was called in to help seal off the affected area and enforce a curfew.

The absence of electrical power and communications were major problems facing Town officials. The Town's water system was affected as a result of storm damage to two well houses; emergency generators furnished by the National Guard were used to operate the Water Plant, wells and sanitary sewer lift stations for a week until power could be restored. The Town's Public Work complex received extensive damage with the garage building and equipment shelter building being completely destroyed.

Coordination of clean-up efforts and repairs to publicly owned facilities became the focus of the Town's efforts. Outside crews rushed to Red Springs to work on the municipal electric system, natural gas lines, telephone lines, cablevision and traffic signals. Red Springs officials were faced with what seemed an impossible job as hundreds of volunteers poured into the community to help with the clean-up. Detailing work assignments, working with the news media and assisting the Corp of Engineers with damage assessment reports for the Federal Emergency Management Agency strained all of Red Springs' human resources.

The damage to the Town's electrical system was so severe that it took the thirteen electrical crews from cities providing mutual aid to Red Springs, six days to restore primary electrical service. It would take several more weeks before secondary service and individual home service could be restored. Not only was forty percent of the distribution system downed, but the Town's electrical substation was heavily damaged requiring temporary emergency repairs. In addition, hundreds of service connections and electrical meters were ripped from individual homes requiring owners to complete their repairs before the Town could restore their power.

The damage estimates for Red Springs' municipal facilities has exceeded $812,000. This includes the cost of debris clean-up, damage to municipal facilities, repairs to municipal utilities and repairs to streets, and curb and gutter.

The impact on the private sector includes damage to private dwellings, businesses and to property other than publicly owned property. These losses could exceed $9,000,000. Almost every building in the central business district received some damage. Roofs were either taken off or collapsed; the Western Auto Store, Pope's 5 & 10, Red Springs Cafeteria and Grantham Insurance Agency along with seven other businesses were completely destroyed. Several of these businesses have relocated; two have rebuilt and others have decided not to reopen, resulting in loss of jobs and income to Red Springs. The Flora McDonald College building, which is listed on the National Register of Historical Property, received damage exceeding $400,000. The adjoining six acres of gardens, which are an important part of our community, were almost completely devastated. The damage to the gardens resulted in a loss of over $50,000 to the restoration group who has been working for the past five years to reestablish the gardens to their original state.

Even though a major effort is being made to clean up and rebuild Red Springs, damage inflicted on the Town by the storm is still clearly evident six months later. Several businesses have closed in the downtown area as a result of the owner's decision not to repair or rebuild their building. Right now, Red Springs residents are just beginning the recovery process which may take several years. The Town, in working through the State Emergency Community Development Program, has received 135 applications from persons in Red Springs claiming unmet needs as a result of the tornadoes' damage. The Town is currently taking bids to repair and replace municipal facilities and equipment. There is still a long way to go, but the community is pulling together to do what needs to be done.

DAMAGE SURVEY REPORTS

A. DEBRIS CLEARANCE

28264 - Metal Garage	3,176.25
28263 - Pole Frame Shed	1,496.40
28259 - Town Parks, Ballpark, Cemetary	1,826.80
28258 - City Streets and Right of Ways	112,932.00
28257 - Stumps from Right of Ways	30,592.00
28003 - Small Debris Clogging Streams	1,920.00
28719 28704 - Private Property 28707	18,675.00

B. PROTECTIVE MEASURES

28260 - Well Buildings, Demolished Electrical Service	796.46
28305 - Drainage - Little Raft Swamp	3,000.00
28576 - Emergency and Safety	31,086.00
28262 - Substation - Temporary Repairs	14,014.00

C. ROAD SYSTEMS

28251 - Missing Signs, Bent Posts and Replacement	6,189.74
28324 - Sidewalks, Curbs and Gutters	8,956.00

E. PUBLIC BUILDINGS

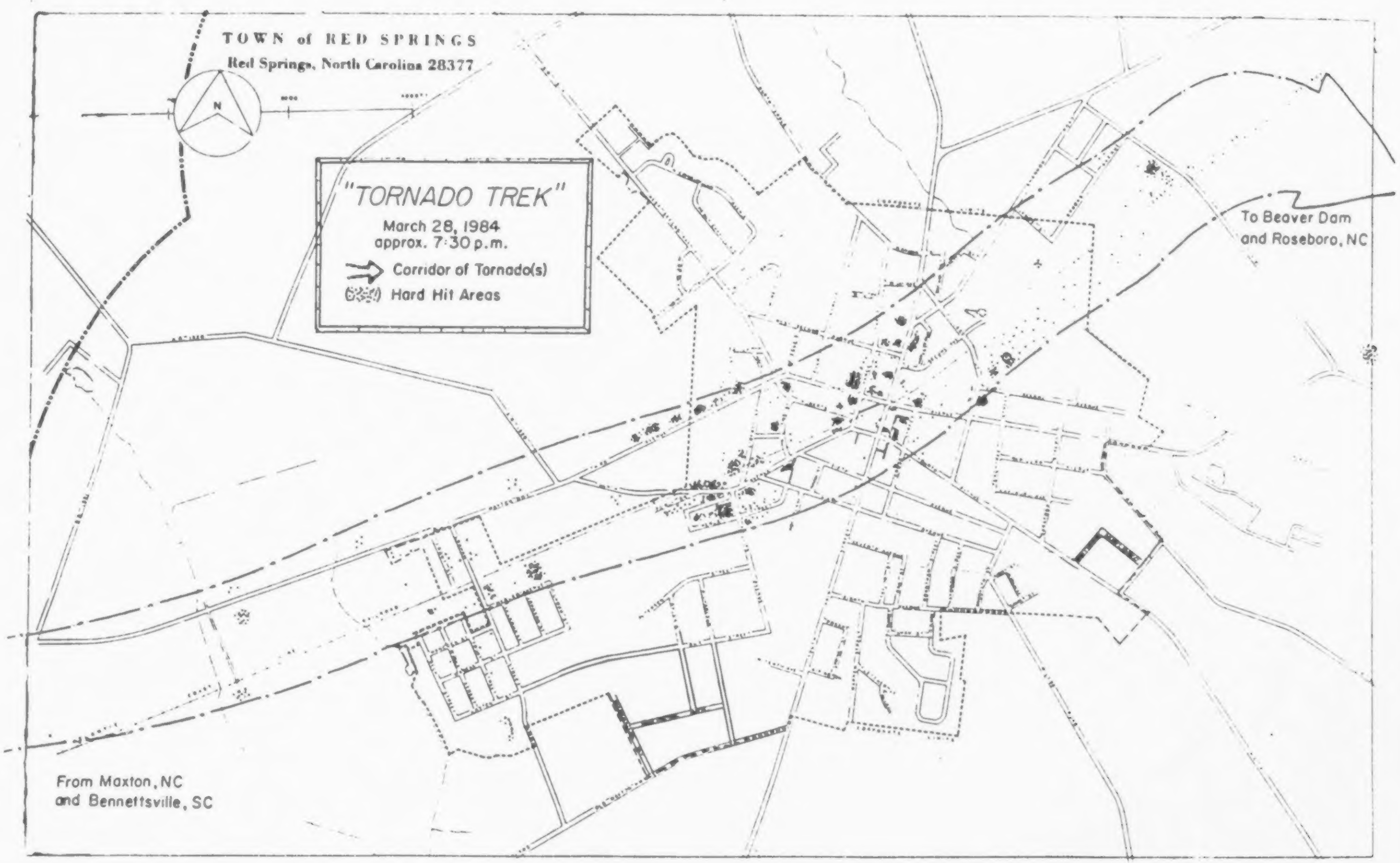
28330 - Police Department Roof	2,641.00
28261 - City Owned Equipment	21,376.34
28265 - Garage (Metal)	58,950.00
28303 - Town Hall	10,198.00
28329 - Fence at Garage	2,036.00
28334 - Courtroom Roof	2,370.00
28331 - Block Warehouse (Electrical Storage)	2,423.00
28328 - Fire Station	2,158.00
28001 - Pole Frame Shelter	17,990.24
28332 - Old Shop Between Liberty & Williams	2,932.00

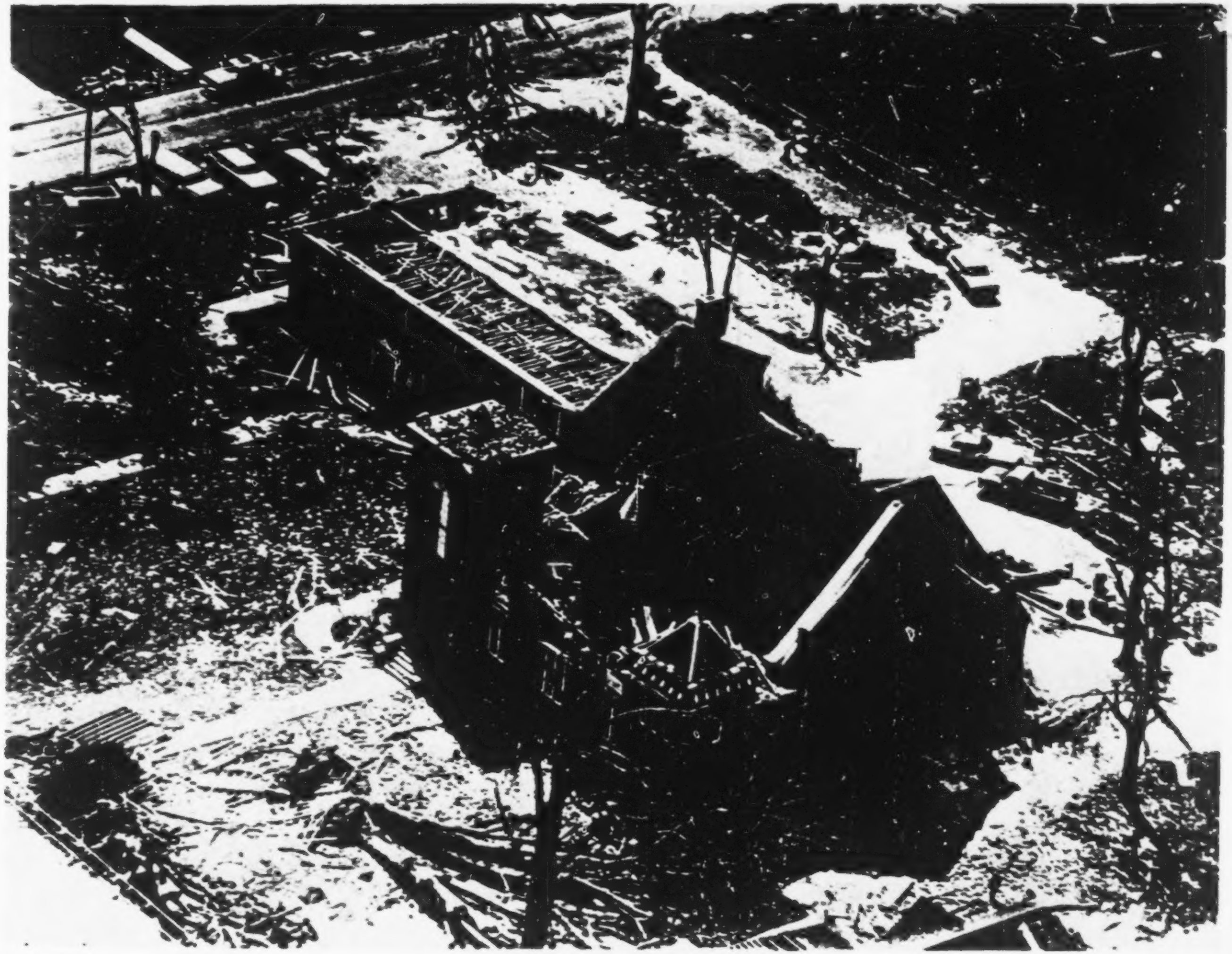
F. PUBLIC UTILITY

28301 - Electrical Distribution System (Force)	196,777.00
28266 - 75,000 Gal. Water Tank & Water Plant	19,583.60
28574 28575 - Repairs to Well Houses	3,792.07
28267 - Electrical Substation	167,075.00
28144 - Electrical Distribution System (Contract)	29,516.00
28720 - Dozer Rental for Dump Area	18,010.00

I. OTHER

28253 - Robins Park - 700 Ft. Fence	11,827.80
28252 - Repairs to Robins Park - Lights, Dugouts, etc.	7,734.00
TOTAL	812,050.70


TOWN of RED SPRINGS
Red Springs, North Carolina 28377
N
"TORNADO TREK"
March 28, 1984
approx. 7:30 p.m.
Corridor of Tornado(s)
Hard Hit Areas
To Beaver Dam
and Roseboro, NC
From Maxton, NC
and Bennettsville, SC



GOOD FOOD
CAFETERIA

Mr. VALENTINE. Mr. Horne, I believe it was in a briefing by officers from the North Carolina National Guard that somewhere in the path of these tornadoes, the force of the wind was such that it lifted a series of fully loaded railroad boxcars which were loaded with bricks, it lifted those cars up off of the rails and overturned them. Was that around your town?

Mr. HORNE. No, sir, I don't believe so.

Mr. VALENTINE. Can you tell us—tell the committee a little bit more about the Flora McDonald College? Is that situated all together in the city of Red Springs?

Mr. HORNE. Yes, sir, almost just about two—about three blocks from the central business district. And, of course, it's a three-story building. It was built back in, I want to say late around 1900. And it was the first Presbyterian women's college in the United States, as I understand it. And there's approximately 15 acres of gardens, 6 which have been reclaimed by the restoration committee.

The building received extensive roof damage and actually lifted part of the roof from the building. It had to be jacked back down and retied to the brickwork. And the workmanship—of course, it being a historical property, the replacement value had to be in compliance with architectural requirements from the National Register. And that is in the process of being done right now. They are restoring the building back to its original form. But the cost is—is—is going to exceed over $400,000 for repairs to the building.

Mr. VALENTINE. Would you care to make any comment or any observation with respect to the—the time and the manner that the warnings came to your city preceding this disaster?

Mr. HORNE. The warnings that were, as I recall, on television were approximately 20 minutes prior to the tornado. But Robeson County's my home, and I've been there for 40 years and have never seen a tornado. I've seen the warnings almost every year for those 40 years—of my adult life, anyway.

To be honest with you, we paid very little attention to them, other than just severe thunderstorm warnings. If there was some way that—in those warnings that you could emphasize to—say, to the degree of severity that would be more of an attention-getter—I don't know how you would do that—but to make people pay attention to them. Even after the tornado, it took people several hours to realize what had happened. They were—as I understand the way tornadoes are, they're are even more difficult at night because you can't see them coming in, you can only hear them. Even as we rode around, it took us, you know, 30 minutes to realize just what had taken place. But I don't know that the warning system was adequate enough in terms of getting people's attention so they realize what was actually taking place.

Mr. VALENTINE. Is there any kind of—was there any kind of official or semiofficial or unofficial setup in the town or the city or the county designed to receive official warnings of Government sources and disseminate that information, or did you, as so many of us do, rely on what you saw on the television—saw and heard on the radio?

Mr. HORNE. Just what we saw on television. There was no local warning system set up that I know of. You're talking in terms of your local civil defense?

Mr. Valentine. Yes.

Mr. Horne. No, sir, not to my knowledge. In fact, as—in my case, for example, as the storm warnings were being flashed, I was stationed to go to church. I was on my way out the door. So that's how seriously I took the warnings at that time.

Mr. Valentine. How far is Red Springs from Fayetteville?

Mr. Horne. Approximately 20 miles.

Mr. Valentine. That is what—what county?

Mr. Horne. We are in Robeson County.

Mr. Valentine. Robeson County. I thought so. You mentioned Robeson County.

You say that you never—never had seen or never had any experience with tornadoes. Are you saying that, to the best of your knowledge, there had never been any storm disturbance in Robeson County since——

Mr. Horne. No, sir. We've had some small storms, but nothing of any significance—you know, where a tobacco barn or some pine trees, something of that nature, but nothing in any population areas.

Mr. Valentine. Did Hurricane Hazel about 30 years ago, its path from the sea come through Robeson County?

Mr. Horne. Yes, sir. I was about 10 years old, and I can still remember it.

Mr. Valentine. Thank you very much, sir.

Mr. Horne. Thank you, Mr. Chairman.

Mr. Valentine. The next witness is Dr. Eric Schneider. Dr. Schneider is the Special Assistant to the Administrator of the National Oceanic and Atmospheric Administration. He works out of Washington, DC. He is a distinguished public servant, and he has something else going for him. His wife is a member of this subcommittee, a distinguished Congresswoman who was invited to come here today but had commitments that made it impossible for her to attend.

We are delighted to have you, Doctor. You may proceed in any fashion that you see fit. If you'd like to summarize your prepared remarks or give it to us verbatim, any way that you would feel most comfortable.

STATEMENT OF DR. ERIC D. SCHNEIDER, SPECIAL ASSISTANT TO THE ADMINISTRATOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, DC, ACCOMPANIED BY JAMES CAMPBELL, SEVERE STORMS OFFICE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, DC

Dr. Schneider. Thank you, Mr. Chairman, and thank you, Mr. Scheuer.

I have some slides that will also accompany our discussion, and I think that I will briefly just go through the testimony as it was prepared.

Mr. Chairman and members of the subcommittee, my name is Eric Schneider, and I am Special Assistant to the Administrator of the National Oceanic and Atmospheric Administration for Oceanic Programs. My job and objective is to ensure coordination of all

NOAA's programs and to review and enhance the quality of these programs.

Following the March 28, 1984, outbreak of killer tornadoes that swept through North and South Carolina, I led a formal independent survey team to review NOAA's National Weather Service's performance. In general, we found that despite communication failure caused by a collapsed microwave tower, shortage of staff in some areas and the unexpected severity of the storm, the National Weather Service performed very well. This was especially true in areas of weather forecasts and warning and linking these warnings with State, county, and emergency management and law enforcement agencies in disaster prevention operations.

In all cases of severe weather incidents or natural disasters where there are more than 30 or more fatalities or more than $100 million in damage, NOAA is required to perform a formal, independent investigation to assess the agency's preparedness and performance during the disaster. Members of the investigation team, led by a NOAA official—in this case myself—included outside consultants with scientific and media expertise, a meteorologist in charge from a region not involved in the disaster, and other scientific experts from academia.

The March 28 storm investigation task force—and we list all the members in the back of my testimony—wrote and submitted a natural disaster survey report and submitted it to the Administrator of NOAA in July of 1984. The report has been submitted in—with my testimony, and copies are available for you and for others here in the hearing room. I would like to briefly describe what a tornado is and what the effects of the killer tornadoes had on North Carolina last March.

[Slide shown.]

Scientists estimate that approximately 100,000 thunderstorms occur in the continental United States each year. Approximately 10,000 of those thunderstorms are classified as severe, which means they produce winds greater than 58 miles an hour or hail three quarters of an inch in diameter or larger. On the average, less than 1,000, or 900, of those severe storms become strong enough to produce tornadoes. The tornado is nature's most violent and destructive wind storm and is defined as a violent rotating column of air in contact with the ground. Tornadoes kill approximately 100 people per year, injure hundreds, and cause several hundred millions of dollars in damaged property. As you can see, the single storm in North Carolina basically did all the damages that were normally occurring in the United States over 1 year.

Mr. VALENTINE. Could you see about getting some of these lights out here so we—we can't see the screen.

[Slide shown.]

Dr. SCHNEIDER. Wind speeds range from 75 miles an hour in weak tornadoes to more than 300 miles an hour in the most violent storms. I should remind you that a major hurricane has winds of like 120 to 130 miles an hour, so these tornadoes are massive, destructive power. Tornadoes generally move from southwest to northeast with forward speeds ranging from less than 5 miles an hour to more than 70 miles an hour.

[Slide shown.]

Typically a tornado is on the ground for 2 miles and is only an eighth of a mile wide, but the more violent storms, such as those on March 28, can have much longer paths and may be up to a mile or more in width. In fact, Dr. Ted Fujita, a noted tornado researcher at the University of Chicago, found that one of the tornadoes in North Carolina on March 28 was at one time almost 4 miles wide—an incredible width considering the widest tornadoes that we have ever observed in the past were a mile and a half wide. Every few years, meteorological parameters come together in such a manner that numerous tornadoes occur over a very wide area. Such was the case on March 28.

The picture I'm giving to you now is that this was a very, very major storm. This may have been the largest tornado ever recorded in the history of the United States, as far as the width and the band that it crossed across the State.

Killer tornadoes and numerous damaging thunderstorms swept through North and South Carolina during the late afternoon and early evening of March 28. Twenty tornadoes, some moving at a ground speed of 60 miles an hour, traveled more than 300 miles from Newberry, SC, to Cates County, NC, in a 4½-hour time span.

[Slide shown.]

The location of the outbreak away from Tornado Alley—the Great Plains and Mississippi Valley—was unusual but not unprecedented.

[Slide shown.]

A similar disaster occurred in South Carolina in April of 1944. A single violent tornado hit Greensboro, NC, in April of 1936.

[Slide shown.]

However, nothing comparable to the scale or violence of the March 28 storms had struck this area since 100 years ago when 60 tornadoes hit Mississippi, Alabama, Georgia, and the Carolinas on February 19, 1884, killing more than 400 people.

[Slide shown.]

The March 28 storms in North Carolina caused more than $2 million in damage, leaving in their wake 59 dead, about 1,300 injured, and more than 3,000 people homeless.

[Slide shown.]

The long-lived intense thunderstorm called a supercell was responsible for a majority of the tornadoes in North and South Carolina.

[Series of slides shown.]

The storm began on the Alabama-Georgia border about 2 in the afternoon, and entered South Carolina about 4 in the afternoon. The storm produced five violent tornadoes in South Carolina before entering North Carolina about 7:10.

[Slide shown.]

Here is a map showing the location of the supercell and the storm track as it went with time to both North and South Carolina and Georgia.

[Slide shown.]

As it entered North Carolina, an AT&T microwave relay tower at Maxton was toppled by the strong winds. This severely curtailed statewide communications, including the NOAA weather wire, which is the weather teletype system providing to subscribers such as the media and local emergency management officials, with a variety of weather information including watches and warnings. As the storm moved swiftly northwest, several other violent tornadoes occurred at Big Swamp, Mount Olive, La Grange, and Ayden. Other tornadoes occurred at Rocky Mount, Lewiston, Ahoskie, and Bennetts Creek.

Our survey team spent the first week of April in the Carolinas. Members of the team divided into subgroups to interview State, county and local officials, media representatives, disaster survey personnel, NOAA employees, and victims of the disaster. We reviewed the devastated area by aircraft, visually estimating the force of the tornadoes based on the amount of physical damage.

The map behind you, Mr. Chairman, is a map of the storm track with the colors indicating the strength of the tornadoes.

Mr. VALENTINE. Excuse me. Do you have any more slides?

Dr. SCHNEIDER. Yes, we do. We'll have a few more.

And this can be looked at later. But it also has an annotation of the force of the tornadoes from what tornado scientists call F-1, which are slight tornadoes, to F-4, which are highly, highly damaging tornadoes—tornadoes. The highest that we record in this format are F-5's. We didn't have any of that. But by any stretch of the imagination, these were very, very severe storms that swept through your area.

Although ours was a scientific investigation, it was impossible to ignore the personal tragedy of the people of North and South Carolina resulting from this disaster, and the outpouring of civic spirit as neighborhood helped neighbor in coping with the effects in this disastrous area. As scientists, we were constantly moved by the civic outpouring of all groups that were rushing to the aid and help of all those that were impacted, and your communities and the people of North Carolina should really be complimented on the way that they served one another in this disastrous time. Being out there in the field, walking and talking with the people, it was something that was very obvious.

Let me briefly outline NOAA's responsibility concerning severe weather warnings. NOAA's National Weather Service is charged with providing severe weather watches and warnings. A tornado watch means a tornado is possible, while a tornado warning means a tornado has been sighted or indicated by radar. In addition, the National Weather Service works with the Federal Emergency Management Agency, FEMA, and State and local agencies to provide training on disaster preparedness and development of citizen assistance during an actual severe weather event. Another role of the Weather Service is to work actively at the State and local level to coordinate and network information during a disaster.

Tornado and severe thunderstorm watches are issued at the National Severe Storms Forecast Center in Kansas City, MO. Forecasters in Kansas City constantly monitor the continental United States and issue watches when severe weather is likely. Watches generally cover about 25,000 square miles and are in effect for 4 to 6 hours. The watch issued on March 28 at 2:15, which was several hours ahead of its disastrous hitting into North Carolina, was unusually large and covered over 50,000 square miles. This was done because the weather system was very potent and fast moving.

Warnings are issued by local weather officials. They are based on radar data, reports from emergency management officials and law enforcement agencies, and trained volunteer spotters. A warning is generally issued for one or two counties, and it is only valid for approximately an hour. Warnings are disseminated to the media and emergency management officials during—with the NOAA weather wire and NOAA weather radio. The Raleigh weather forecast office has warning responsibility for this area.

I would like to summarize the findings and recommendations of the disaster survey team, and the full report is available to us here today.

The National Weather Service Severe Storms Forecast Center in Kansas City, MO, has the national responsibility for issuing tornado and severe storm watches. The tornado watches and coordination calls made by the severe local storms forecasters were superbly accurate with long lead times enabling the National Weather Service offices to bring in extra staff and alert the entire population to the threat of severe weather that was developing. The survey team was also impressed with the skills, professionalism and dedication of the staff of the National Severe Storms Forecast Center and the weather services in the Carolinas.

The team believes the job of community liaison and coordination is the cornerstone of the National Weather Service's warning program. It entails continuous public education campaigns by local media on the hazards of storms and floods; the recruiting and training and retraining of volunteer storm spotters by the National Weather Service and local civilian personnel; maintaining and promoting news media cooperation in the dissemination of weather forecasts and warnings; linking warning dissemination cities with city, county and State emergency management and law enforcement agencies in disaster prevention operations; and ensuring vital feedback of storm occurrences from State and local communities.

While Raleigh's Weather Service Forecast Office has established excellent and close working relationships with State emergency management officials and key media outlets in the immediate area, needed links to county and city emergency agencies were found wanting. To satisfy the responsibilities of the National Weather Service, the team recommended that vacancies be filled and a warning preparedness meteorologist be placed in Raleigh for the purpose of improving community liaison and recruiting and training spotter networks.

We also discovered that FEMA's national warning system, NAWAS, a voice circuit that interconnects with emergency management and law enforcement agencies with 24-hour operations, was not used to solicit severe weather information or reports. The team recommended that NAWAS be utilized to solicit severe weather reports. The team also recommended that backup communications be explored and used when the NOAA Weather Wire fails, as it did when the commercial microwave tower in Maxton collapsed.

Several Weather Service radars covered North Carolina, including 10-centimeter network coastal radars at Wilmington and North—and Cape Hatteras. And these have been especially installed for looking at hurricanes offshore. However, the bulk of the warnings were issued by the Raleigh office using a 5-centimeter local warning radar. The 5-centimeter radars were severely limited by the interfering echoes that made it impossible to track the tornado-producing supercell or to ascertain several weather signatures. In many cases, only severe thunderstorms warnings were issued because attenuated radars failed to identify the existence of the tornado.

We found that NOAA weather radio was an excellent warning and information source and found that many officials, including emergency management officials and broadcasters in the warning chain, relied on NOAA weather radio. Unfortunately, a considerable segment of the public is still unaware of the existence of the value and low cost of the NOAA weather radio system. We discovered areas where people said that they could not hear NOAA weather radio broadcasts. We recommend the Weather Service redouble its efforts to call attention to the existence and value of NOAA weather radio, especially in promoting its tone alert for warning purposes.

In closing, Mr. Chairman, the string of storms that crossed the Carolinas on March 28 spawned the most devastating tornadoes to hit the Carolinas in 100 years, and based on our findings, may have been the biggest ones ever recorded. The losses recorded and experienced by the people of your State were large, but they may have been much greater if it were not for the heroic and dedicated efforts of your National Weather Service personnel working closely with the State and local entities on the area.

Mr. Chairman, I thank you for the opportunity to appear before you today, and I will be happy to answer any questions you have regarding my testimony.

At this time, I think it would be important to show you an example of where this system really did operate well. And I have with me Mr. Jim Campbell of our severe storms office in Washington, DC, who is going to give you an example of what happened in Bennettsville, right over the border from you. And here is an example where the system operated well, lives were saved—and this is an example of how we would like to see the Weather Service working closely with towns and local officials to prevent the types of disasters that this town was able to.

After Mr. Campbell finishes with his brief show, which is an interesting and an exciting story, I will be available for questions.

Mr. VALENTINE. Thank you very much, Dr. Schneider. And, Mr. Campbell, we are delighted to have you. Just please proceed.

Mr. CAMPBELL. Thank you very much.

As you can well imagine, there's a——

Mr. VALENTINE. It's the electronic age. We've got to get our wires uncrossed.

Mr. CAMPBELL. As you can well imagine, Mr. Chairman, there's a great difference around the Nation in community awareness and warning coordination—throughout the United States.

And as a member of the survey team, I happened to come across a very well prepared community in Bennettsville, SC. As a former warnings preparedness meteorologist, I'm sensitive to those things. So we went back to document what happened and use it as a model. Certainly there are many well prepared communities in both of the Carolinas. Because we happened to come out on this one, we just wanted to show you what a good preparedness community program is like.

[Slide shown.]

So let's go to Bennettsville, SC—and maybe if we could cut the light a little bit, please.

Bennettsville is a community of about 8,500 people, located 100 miles northeast of Columbia, SC, near the North Carolina-South Carolina border. In fact, it's not too far from the Red Springs-Maxton area where some of the large tornadoes struck.

[Slide shown.]

Bennettsville is about a fifth of the size of the town here in Rocky Mount.

[Slide shown.]

Bennettsville is the county seat for more than 30,000 people and, within the county, tobacco farming, cotton farming and light industry form its economic base.

[Slide shown.]

It's a very proud community. Even considering that they've had high unemployment for the last year to year and a half, they have a lot of pride in what they've done in Bennettsville.

[Slide shown.]

Well, let's start this Bennettsville story back on March 28 when they began their Tornado Awareness Week, a statewide awareness week. And you have awareness weeks here in North Carolina. In fact, many years awareness weeks are held jointly.

[Slide shown.]

This is a picture of the Marlboro Herald Advocate, one of the major newspapers in Bennettsville. During Tornado Awareness Week, they published several articles talking about tornadoes, tornado safety, what people should do.

[Slide shown.]

In addition, radio station WBSC, located 5 miles out of town, a 10,000-watt radio station which is operated 24 hours a day, they ran 125 public service announcements during Tornado Awareness Week—again, talking about tornadoes, tornado safety, what you should do.

[Slide shown.]

The response in the town following the disaster was centered at the fire department, very active in the community.

[Slide shown.]

These two gentlemen played a major role in how Bennettsville responded to the disaster. Fire Chief Jerry Raley on the right directed 330 men and over 70 vehicles following the night of the disaster. He credited his efficient handling of the situation with the fact that they had conducted the disaster drill about 2 weeks before simulating an airline crash complete with victims.

Marion Roberts, the civil defense director in Bennettsville, ensured that the schools got literature during Tornado Awareness Weeks, put on programs, and also made sure that the schools had tornado drills.

[Slide shown.]

Let's go now to the afternoon of March 28, when the tornado watch was first issued. Around 2:15 in the afternoon, the radio station began broadcasting the watch. They also used the NOAA radio system out of Florence, SC, which gave both safety rules and weather information concerning the storm system.

WBSC also had their own safety rules that they played. They continued to do that throughout the afternoon, and the people in the community began to get a heightened awareness that maybe something was brewing in—off to the west.

In fact, one of the things they do in Bennettsville—and it is very unusual—they actually blew the fire sirens in Bennettsville to alert the people to a tornado watch. Now, we have places in the Midwest that have much higher frequencies of tornadoes. For example, in North and South Carolina, we average about 9 to 12 tornadoes a year with maybe one fatality; places out in the Midwest, where it is much, much higher than that, they don't blow fire sirens or any kind of sirens for a watch. They usually do for warnings or not—but not for watches. So it is very unusual to have this happen in the town.

But, again, it heightened the people's awareness. It made them—for those that didn't know what was going on, they contacted the radio station. They began to get the sense that there was something going to happen later on.

[Slide shown.]

That evening, around 6:30 p.m., the National Weather Service called the State Emergency Operations Center who, in turn, called the civil defense director in Bennettsville to notify him that a very strong thunderstorm was moving in—into Marlboro County, which is the county where Bennettsville resides. It was a VIP level 6. VIP level 6 is the strongest thunderstorm that we have.

Based on that information, they decided to sound the siren for a warning in Bennettsville. At 6:30, they sounded that warning. The sirens blow for almost 30 minutes.

[Slide shown.]

And at 2 minutes after 7:00, an F–4 tornado, packing winds of 200 miles an hour, slammed into the shopping center of Bennettsville. What you see there is what's left of Rose's Department Store.

[Slide shown.]

If we take a closer look, eight people inside that store when the tornado hit—not one of them died because many of them got under pieces of furniture or found some way to protect themselves.

[Slide shown.]

Let's go down the street a little bit here. This is a Food Liner and a hardware store. What happened here is a young woman and two children coming out of the store just about the time the tornado hit. They had gotten in their car. The wind started blowing very hard. In fact, one of the windows popped out of the car. The woman screamed for her children to get—run into the store. They opened the door.

[Slide shown.]

A 6-year-old boy got out of the car, ran into the store, got under a counter, put his head on his knees, the position that he had learned in school. That probably saved his life.

The older boy ran—also tried to run in the store, but he was forced by the winds down the street. In fact, he was actually picked up by the tornado—not very high, maybe about 10 yards or so—

and was picked up by the tornado, and then he was hit on the head with some sort of debris and was knocked unconscious. But other than that, he was all right.

The woman tried to get out of the driver's side of the car, was unable to do so because the wind was so strong—she slid out the passenger side. About then, the tornado hit and it forced her into the store. She was pushed up against the counter. She got under the counter, and she also survived. One of her big problems is that she was sandblasted by the tornado. They had to pick dirt and sand out of her—both her arms and legs following the—following the tornado.

But that action of that 6-year-old boy is what—what this community awareness and safety is all about.

[Slide shown.]

The next place the tornado hit was an apartment complex, 174 units, over 300 people living in that apartment complex. Here is one of the buildings completely collapsed by the tornado.

[Slide shown.]

Let's go around the other side of that building. Three women on the lower floor were inside watching television. They heard the tornado coming, they got under some furniture, and somehow they managed to crawl out of that building with only a few minor scratches—again, because in those last few seconds they knew what to do.

[Slide shown.]

Here's another one of the apartment buildings completely collapsed. You notice that a symbol of our modern age of a television completely free from any damage from that tornado. And sometimes some strange things do happen in tornadoes.

[Slide shown.]

This is the remainder of the apartment complex. You can see there's very serious damage here. And yet, nobody died in this apartment complex because they got under something, they got into a closet, they took some sort of protective action. And all that awareness going on through the afternoon, we think, helped those people respond to this tornado.

[Slide shown.]

Here's—the next place it hit was a residential neighborhood of fairly expensive homes in Bennettsville. You can see there pretty substantial damage to that home.

[Slide shown.]

But let's go right across the street and look at that. There's not one bit of damage at all.

Sometimes we find that in these very large tornadoes you will have two or three smaller tornadoes rotating around inside, and it's these smaller tornadoes that cause all the damage.

[Slide shown.]

Here's a good example of that. There's three houses here, the one in the middle completely destroyed. Now there was damage to the front side of those two houses, but the one in the middle completely gone, probably further evidence that there were some smaller twisters, very intense twisters, inside the large funnel.

[Slide shown.]

Of course, one of the things—it's always hard to realize how awesome the power of a tornado is. And you can imagine the—the surprise on these people's face when they looked out and saw that 28-foot steel beam in their front yard. That beam weighs somewhere between 20 and 60 pounds per foot, and it is buried 6 to 8 feet in the ground. That means minimum it weighs somewhere around 600 pounds. That beam was picked up from a carport, carried about a quarter mile, and dropped in that front yard.

[Slide shown.]

Another house severely damaged. This house was owned by the vice president of a bank in town, built well above the building codes.

An interesting story along with this house. The front door there, the winds began to pick up, the family had been concerned. They had heard the watches, they had heard the siren, and they were watching the weather very closely. The wind started to blow hard and the metal stripping just inside that door began to make a very shrill sound. That brought the family to the center of the house. The man told his wife and three children to get into the bathroom on the lowest floor in the hallway. For some reason he couldn't explain to me, he went to the door like he was going to try to hold back the force of the tornado. Of course, at that point, he didn't know it was a tornado. He said he put his hand on the door and he pushed, and the door pushed back at him, and he could feel that door pulsing. And it was then he decided it was a tornado and that he better get in the closet, too. And that is exactly what he did. And by that time it hit with its full force. There was a lot of damage inside the house, a lot of glass blowing around, and they were in that closet—no injuries to them. Again, they knew what to do, and they responded to that tornado.

[Slide shown.]

This is another home. To illustrate that we tell people that the closet or bathroom is a safe place to be—of course, the best place is on the first floor—up there on the second floor, those two doors, the one on the left happens to be a bathroom, the one on the right is the closet.

[Slide shown.]

Now one of the real tragedies in Bennettsville occurred actually outside the city limits. There were no fatalities in Bennettsville. This was a mobile home park that was hit by the tornado. And there were mobile home parks both in North and South Carolina that was hit. In fact, about 50 percent or maybe a little bit more of the fatalities in both States were due to deaths in mobile homes. This particular mobile home, there were 21 people living in it, 7 trailers. There's trailer No. 1, what's left of that one.

[Slide shown.]

Here's No. 2. Notice the steps going up to once—what once was the mobile home. People lived in that mobile home as a family of four. The man was away at work. The mother and two children were at home. The mother and one child was killed by the tornado. The man got home, they found his 10-day-old baby alive about 50 yards away in a field completely unhurt. His wife and child were gone.

[Slide shown.]

This is the third mobile home.

[Slide shown.]

Let's take a closer look. Again, notice how the steel support of that mobile home has just been bent in half by the force of the tornado.

[Slide shown.]

Here we're looking at the fourth.

[Slide shown.]

The fifth mobile home. An elderly gentleman living in one of these mobile homes was picked up by the tornado, carried over into a field and was found dead on a mattress. He was the third fatality in that mobile home park.

[Slide shown.]

This is the sixth mobile home.

[Slide shown.]

And here we have the seventh mobile home in that trail—in that trailer park.

That's why it's so important that mobile homes—you have to get out of a mobile home during a tornado. And there were very serious injuries in that storm, too.

[Slide shown.]

This is the field where they actually found the—the elderly gentleman was found over in that woods lying on the mattress that one was the—that was the third fatality.

[Slide shown.]

Now, a lot of times in tornadoes, you don't find—strange things happen. You see here the blacktop is gone from the road. The tornado actually stripped the blacktop right off the road. When I first was out there surveying, I thought maybe that water damage—there had been a lot of rain associated with that, and I thought maybe some flooding.

[Slide shown.]

But when I found pieces of blacktop 40, 50, and 60 yards away that size and no evidence of water, indeed I knew the tornado had stripped that road of blacktop.

[Slide shown.]

You also find things like boards driven into the ground—not uncommon—sticks.

[Slide shown.]

You find—here's a place where—you can't see that too well in this light—but that's a hole in a house where a two-by-four was actually driven completely through the house.

[Slide shown.]

Here's a picture again—it might be a little dim—but there's a stone that's been driven into a door. And those are the kind of things that tornadoes do.

In closing, Mr. Chairman, I—I'd like to make the point that—I think we can go to Red Springs to show this point.

[Slide shown.]

One of the things that we are most concerned about in the weather and why we feel that the weather, working together with local and State governments and the media, form a team so that communities can become aware and warning coordination can take place, our biggest fear is to see a school like this in Red Springs hit during the day when school is in session.

[Slide shown.]

Can you imagine looking at that how many children, 50, 100, could be killed in a situation like that, and many of them injured if there were not Awareness Weeks, if there were not preparedness, if schools did not conduct drills. Schools like this are survivable in tornadoes. We have had schools hit in the past and children have survived. But they have to get into those hallways. They have to have those tornado drills and be able to put their hands on their knees like that little boy did in the shopping center. And that's what we feel is the most important, is to have that total coordination process. And when that is successful, you have stories like Bennettsville.

Thank you.

[The prepared statement of Dr. Schneider follows:]

STATEMENT OF
DR. ERIC D. SCHNEIDER
SPECIAL ASSISTANT TO THE ADMINISTRATOR
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

before the

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ROCKY MOUNT, NORTH CAROLINA

OCTOBER 18, 1984

Mr. Chairman and Members of the Subcommittee:

My name is Eric Schneider. I am Special Assistant to the Administrator of the National Oceanic and Atmospheric Administration (NOAA) for Oceanic Programs. My objective is to ensure coordination of all NOAA s programs and to review and enhance the quality of NOAA's programs.

Following the March 28, 1984 outbreak of "killer tornadoes" that swept North and South Carolina, I led a formal, independent survey team to review NOAA's National Weather Service performance. In general we found that despite communication failure caused by a collapsed microwave tower, shortage of staff in some areas and the unexpected severity of the storm, the National Weather Service performed very well. This was especially true in the areas of weather forecasts and warnings and linking these warnings with state, city and county emergency management and law enforcement agencies in disaster prevention operations.

In all cases of severe weather incidents or natural disasters where there are 30 or more fatalities or more than $100,000,000 damage, NOAA is required to perform a formal, independent investigation to assess the agency's preparedness and performance during the disaster. Members of the investigation team, led by a NOAA official, include outside consultants with scientific and media expertise, a meteorologist in charge (MIC) from a region not involved in the disaster, and other scientific experts from academia. The March 28 storm investigation task force (list of members attached) wrote and submitted a "Natural Disaster Survey Report" to the Administrator of NOAA in July 1984. The report will be submitted as part of my testimony, which will highlight its findings. Before discussing the task force findings, I would like briefly to describe what a tornado is and what effects the killer tornadoes had on North Carolina last March.

¶ Scientists estimate 100,000 thunderstorms occur in the continental United States each year. Approximately 10,000 of those thunderstorms are classified as "severe", which means they produce winds greater than 58 miles an hour or hail 3/4 inch in diameter or larger. On the average, 900 of those severe thunderstorms become strong enough to produce tornadoes. The tornado is nature's most violent and destructive wind storm and is defined as a violent rotating column of air in contact with the ground. Tornadoes kill 100 people a year, injure hundreds, and cause several hundred million dollars in property damage.

¶ wind speeds range from 75 miles an hour in weak tornadoes to more than 300 miles an hour in the most violent ones. Tornadoes generally move from southwest to northeast with forward speeds ranging from less than 5 miles an hour to more than 70 miles an hour.¶ Typically, a tornado is on the ground for 2 miles and is 1/8 of a mile wide, but the more violent storms, such as those on March 28, 1984, can have much longer paths and be up to a mile or more in width. In fact, Dr. Ted Fujita, a noted tornado researcher at the University of Chicago, found one of the tornadoes of March 28 was at one time almost 4 miles wide -- an incredible width considering the widest tornadoes we have observed in the past were about 1-1/2 miles. Every few years, meteorological parameters come together in such a manner that numerous tornadoes occur over a wide area. Such was the case on March 28.

Killer tornadoes and numerous damaging thunderstorms swept through North and South Carolina during the late afternoon and evening of March 28. Twenty tornadoes, some moving at a ground speed of 60 miles an hour, traveled more than 300 miles from Newberry, South Carolina, to Cates County, North Carolina in a 4-1/2 hour span¶ The location of the outbreak, away from "Tornado Alley" -- the Great Plains and the Mississippi Valley -- was unusual but not unprecedented.¶ A similar disaster occurred in South Carolina in April 1944, and a single violent tornado hit Greensboro, North Carolina, in April 1936.¶ However, nothing comparable to the scale or violence of the March 28 storms had struck the area since 100 years ago when 60 tornadoes hit Mississippi, Alabama, Georgia, and the Carolinas on February 19, 1884, killing more than 400 persons.

¶The March 28 storms in the Carolinas caused more than $200 million in damage, leaving in their wake 59 dead, about 1,300 injured, and more than 3,000 homeless.

¶One long-lived intense thunderstorm called a supercell was responsible for a majority of the tornadoes in North and South Carolina. The 58 storm began on the Alabama-Georgia border about 2 p.m., EDT, and entered South Carolina just after 4 p.m. The storm produced 5 violent tornadoes in South Carolina before entering North Carolina around 7:10 p.m. ¶As it entered North Carolina, an AT&T microwave relay tower at Maxton was toppled by the strong winds. This severely curtailed statewide communications, including the NOAA Weather Wire which is a weather teletype system providing subscribers, such as the media and local emergency management officials, with a variety of weather information including watches and warnings. As the storm moved rapidly northeast, several other violent tornadoes occurred at Big Swamp, Mount Olive, La Grange, and Ayden. Other tornadoes occurred at Rocky Mount, Lewiston, Ahoskie, and Bennetts Creek.

Our survey team spent the first week of April in the Carolinas. Members of the team divided into subgroups to interview state, county, and local officials, media representatives, disaster service personnel, NOAA employees, and victims of the disaster. We reviewed the devastated area by aircraft, visually estimating the force of these tornadoes based on the amount of physical damage. We visited the communities of Raleigh, Wilmington, Greenville, New Bern, Maxton, Red Springs, and Fayettesville in North Carolina, and Columbia, Greenville, and Bennettsville in South Carolina. Although ours was a scientific investigation, it was impossible to ignore the personal tragedy of the people of North and South Carolina resulting from this disaster and the outpouring of civic spirit as neighbor helped neighbor in coping with the effects of this disastrous event.

Let me briefly outline NOAA's responsibility concerning severe weather warnings. NOAA's National Weather Service is charged with providing severe weather watches and warnings. A tornado watch means a tornado is possible, while a tornado warning means a tornado has been sighted or indicated by radar. In addition, the National Weather Service works with the Federal Emergency Management Agency and state and local agencies to provide training on disaster preparedness and development of citizen assistance during an actual severe weather event. Another role of the Weather Service is to actively work at the state and local level to coordinate and network information during a disaster.

Tornado and severe thunderstorm watches are issued by the National Severe Storms Forecast Center in Kansas City, Missouri. Forecasters at Kansas City constantly monitor the continental U.S. and issue watches when severe weather is likely. Watches generally cover about 25,000 square miles and are in effect 4-6 hours. The watch issued March 28 at 2:15 p.m., EDT, for North Carolina was unusually large, covering 50,000 square miles. This was done because the weather system was very potent and fast moving.

Warnings are issued by local weather officials. They are based on radar data; reports from emergency management officials and law enforcement agencies; and trained volunteer spotters. A warning is generally issued for one or two counties and is valid for approximately 1 hour. Warnings are disseminated to the media and emergency management officials via the NOAA Weather Wire and NOAA Weather Radio. The Raleigh Weather Service Forecast Office has warning responsibilty for this area.

I would like to summarize the findings and recommendations of the disaster survey team.

The National Weather Service National Severe Storms Forecast Center at Kansas City, Missouri, has the national responsibility for issuing tornado and severe thunderstorm watches. The tornado watches and coordination calls made by the severe local storms forecasters were superbly accurate with long lead times enabling the National Weather Service offices to bring in extra staff and alert the entire populace to the threat of severe weather that developed. The survey team was also impressed with the skills, professionalism, and dedication of the staff at the National Severe Storms Forecast Center and the weather offices in North Carolina.

The team believes the job of community liaison and coordination is the cornerstone of the Weather Service Office's warning program. It entails continuous public education campaigns by local organizations and the media on the hazards of storms and floods; recruiting, training, and retraining of volunteer storm spotters by the NWS and local civil preparedness personnel; maintaining and promoting news media cooperation in the dissemination of weather forecasts and warnings; linking warning and dissemination systems with city, county, and state emergency management and law enforcement agencies in disaster prevention operations; and ensuring vital feedback of storm occurrences from state and local communities.

While Raleigh's Weather Service Forecast Office has established excellent and close working relationships with State Emergency Management Officials and key media outlets in its immediate area, needed links to county and city emergency agencies were found wanting. To satisfy the responsibilities of the National Weather Service, the team recommended that vacancies be filled and a warning preparedness meteorologist be placed in Raleigh for the purpose of improving community liaison and recruiting and training spotter networks.

We also discovered that FEMA's National Warning System (NAWAS) -- a voice circuit that interconnects with emergency management and law enforcement agencies with 24-hour operations -- was not used to solicit severe weather information or reports. The team recommended NAWAS be utilized to solicit severe weather reports. The team also recommended that back-up communications be explored and used when the NOAA Weather Wire fails, as it did when the commercial microwave tower in Maxton collapsed.

Several weather service radars covered North Carolina, including 10-centimeter network coastal radars at Wilmington and Cape Hatteras. However, the bulk of the warnings were issued by Raleigh using a 5-centimeter local warning radar. The 5-centimeter radars were severely limited by intervening echoes that made it impossible to track the tornado producing supercell or to ascertain severe weather signatures. In many cases, only severe thunderstorm warnings were issued because attenuated radars failed to identify the existence of a tornado.

We found that NOAA Weather Radio (NWR) was an excellent warning and information source and found that many officials, including emergency management officials and broadcasters in the warning chain, relied on NWR. Unfortunately, a considerable segment of the public is still unaware of the existence, value and low cost of NWR. We also discovered areas where people said they could not hear NWR broadcasts. We recommend the Weather Service redouble its efforts to call attention to the existence and value of NWR, especially in promoting its tone alert for warning purposes.

In closing, Mr. Chairman, the string of storms that crossed the Carolinas on March 28, 1984 spawned the most devastating tornados to hit North Carolina in 100 years and based on some of our findings, they may have been the biggest ones ever recorded. The losses experienced by the people of your State were large, but they may have been much greater were it not for the heroic and dedicated efforts of your National Weather Service personnel working closely with the state and local entities in the area.

Mr. Chairman, thank you for the opportunity to appear before you today. I will be happy to answer any questions you may have regarding my testimony.

DISASTER SURVEY TEAM MEMBERS

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NATURAL DISASTER SURVEY REPORT
TO THE ADMINISTRATOR
OF THE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

CAROLINA TORNADOES
AND
NORTHEAST COASTAL STORM
OF MARCH 28, 1984

July 1984
Washington, D.C.

DISASTER SURVEY TEAM MEMBERS

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Members of the team visited the Carolinas and the states of New York, Massachusetts, Pennsylvania, and New Jersey between April 2 and April 6, 1984. The field portion of the survey included trips into and over the damage area. The team interviewed state, county, and local officials, media representatives, disaster service personnel, NOAA employees, and victims of the disaster. Communities, such as Raleigh, Wilmington, Greenville, New Bern, Maxton, Red Springs, and Fayetteville in North Carolina, and Columbia, Greenville, and Bennettsville in South Carolina, were visited. In the northeast, team members traveled to Boston, New York City, Philadelphia, Atlantic City, and several coastal communities along the New Jersey shore.

The survey team wishes to thank the numerous individuals who cooperated in giving their time and assistance. These included personnel of NOAA, state officials in the Carolinas and northeast U.S., city and county officials, members of the news media, and disaster service personnel. Their help made this report possible and will contribute to improvements in the warning system. A special thanks also goes to all the citizens of Bennettsville who helped contribute to this report.

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EXECUTIVE SUMMARY

Killer tornadoes and numerous damaging thunderstorms swept through North and South Carolina during the late afternoon and evening of March 28, 1984. Twenty tornadoes, some moving at ground speeds of 60 miles an hour, traveled more than 300 miles from Newberry, S.C., to Gates County, N.C., over a four and one-half hour span. The location of the outbreak, away from "Tornado Alley" — the Great Plains and the Mississippi Valley — was unusual but not unprecedented. A similar disaster occurred in South Carolina in April 1944, and a single violent tornado hit Greensboro, N.C., in April 1936. However, nothing comparable to the scale or violence of the present outbreak had struck that area for 100 years when 60 tornadoes hit Mississippi, Alabama, Georgia, and the Carolinas on February 19, 1884, killing more than 400 persons.

The March 28 storms in the Carolinas caused more than $200 million in damage, leaving in their wake 59 dead, about 1,300 injured, and more than 3,000 homeless.

The National Weather Service's National Severe Storms Forecast Center at Kansas City, Mo., has the national responsibility for issuing tornado and severe thunderstorm watches and severe weather outlooks. A Satellite Field Service Station is an integral part of the National Severe Storms Forecast Center and provides essential weather satellite information and guidance to the Severe Local Storms forecasters at the Center. The convective outlooks, the tornado watches, and the coordination calls made by the Severe Local Storms forecasters were superbly accurate with long lead times enabling the National Weather Service offices to bring in extra staff and alert the entire populace to the threat of severe weather that developed much later in the afternoon and evening hours. The survey team was in general impressed with the skills, professionalism, dedication, and motivation of the staffs at the Center and at the Weather Service Forecast Offices at Columbia, S.C., and Raleigh, N.C.

The issuance of tornado warnings and community preparedness activities was uneven in the two states. There was an absence of organized tornado spotter networks in North Carolina and although reports from tornado spotters in South Carolina were valuable, they were limited. Much of the time local warning radar was of marginal value in indicating tornadoes or identifying the supercell that produced tornadoes in both states.

North Carolina's warning/dissemination problem was exacerbated when a tornado crossed the North Carolina border at about 7:15 p.m. destroying a microwave tower at Maxton, N.C. It knocked out the entire North Carolina NOAA Weather Wire Service in the state. It was not restored until 9:20 p.m., after almost all tornadoes had passed through the state. The NOAA Weather Wire Service is the major link between the broadcast media and other key users in the warning chain, ultimately including the public at large.

Although the storm's most dramatic — and tragic — effects were felt in the Carolinas, the system did not end there. It continued northeast as a coastal storm, dropping heavy, wet snow on the Northeast, knocking out power, causing coastal flooding, and eroding beaches. Although loss of life from the storm was low — four fishermen perished off Long Island, N.Y., and two persons were killed by falling tree limbs in Washington, D.C. — property damage was high, with estimates ranging from $100 million to $500 million.

The following are specific findings and recommendations.

Finding 1:

The job of community liaison and coordination is the cornerstone of the weather service office's warning program. It entails continuous public education campaigns on the hazards of storms and floods; recruiting, training, and retraining of volunteer storm spotters; maintaining and promoting news media cooperation in the dissemination of weather forecasts and warnings; linking warning and dissemination systems with city, county, and state emergency management and law enforcement agencies in disaster prevention operations; and ensuring vital feedback of storm occurrences. In South Carolina there had been relationships built up for several years involving a great deal of staff time by all National Weather Service offices in the state. These linkages paid lifesaving dividends during the intense storm activity on March 28. A Tornado Awareness Week from February 26 through March 3 was instrumental in creating a heightened awareness and resulted in decisive educational campaigns and tornado drills by officials and schools throughout the state.

However, there is cause for concern about the future of warning coordination in South Carolina. There is a serious staff shortage at the Columbia Weather Service Forecast Office that has severely curtailed the amount of time needed to develop and foster the relationships in its county warning responsibility and with other National Weather Service offices under its area management responsibilities. While the Columbia Weather Service Forecast Office does have a dedicated warning/preparedness meteorologist on its staff, she has been able to spend less than 50 percent of her time in the last four years in fostering community preparedness ties because of the press of forecasting duties.

In North Carolina, the staff situation is even more critical. The state is larger. The number of counties and WSOs is greater. There is a potentially explosive flash flood problem in its western counties, a dangerous hurricane potential along its populated coastline, as well as the severe storm problem. Yet, the Weather Service Forecast Office in Raleigh has carried critical vacancies for prolonged periods. It does not have a dedicated warning/preparedness meteorologist and never has had one. South Carolina's warning/preparedness meteorologist has been asked to also cover the state of North Carolina — an impossible situation. While Raleigh's Weather Service Forecast Office has established excellent and close working relationships with State Emergency Management officials and key media outlets in its immediate area, the same needed links to county and city emergency agencies and to TV and radio stations in the areas affected by the March 28 storms were found wanting. Further, there is evidence that the staffing situation for the essential community warning coordination responsibilities is uneven throughout the U.S.

Recommendation 1:

The staffs of both Weather Service Forecast Offices should be augmented as soon as possible to ensure an effective National Weather Service-community warning program throughout the Carolinas. A dedicated warning/preparedness meteorologist would give essential focus to the program at Raleigh. With full staffing, the warning/preparedness meteorologists, as well as other members of the staff, including the meteorologists in charge, could devote the time needed in the distant counties. The assistance provided to emergency management agencies and local media in conducting drills and public awareness campaigns are prime responsibilities of the National Weather Service staffs. In the first six months of 1984, there have been the greatest number of tornadoes and deaths in the last 10 years. About 1,000 tornadoes and more than 120 deaths in 12 states have been recorded. In addition, there has been widespread flooding throughout the United States. The survey team recommends that the National Weather Service warning and related coordination and dissemination linkages with communities all across the United States be examined thoroughly to ensure the viability of the Weather Service's main mission of issuing warnings and ensuring the safety of the populace. The study should be extensive and done as soon as practicable.

Finding 2:

While tornado spotters and amateur radio operations played a major role in relaying reports to Columbia from the northeast part of South Carolina, the survey team could find no evidence of organized severe storm reporting networks in the other areas of South and North Carolina affected by the tornadoes and severe thunderstorms on March 28. As described in official National Weather Service directives as well as in documented cases, such networks with communication capabilities are an imperative for an effective severe storm warning system.

Recommendation 2:

Every effort must be made as soon as possible to recruit, establish, and formalize such networks. Since it requires much time and attention by a motivated, knowledgeable meteorologist and meteorological technicians with the ability to train and maintain such networks, Recommendation 1 above is hereby reinforced.

Finding 3:

Through the auspices of the Federal Emergency Management Agency, National Weather Service offices have access to the National Warning System (NAWAS) — a voice circuit that interconnects with emergency management and law enforcement agencies with 24-hour operations. While some states have restrictions on its use by the National Weather Service, such was not the case in either North or South Carolina. Both Weather Service Forecast Offices used NAWAS extensively for dissemination of warnings. Neither used the circuit to solicit information or reports.

In South Carolina, reports of major damage and fatalities were not received at the Weather Service Forecast Office at Columbia until long after the storms had moved into North Carolina.

Recommendation 3:

The Raleigh and Columbia Weather Service Forecast Offices should make the appropriate arrangements with their respective State Emergency Management agencies to use NAWAS to gather reports. They should also maintain up-to-date lists of NAWAS warning points and officials. In addition, a South Carolina NAWAS telephone hotline should be placed in the Raleigh WFSO.

When weather offices receive timely reports of fatalities or major damage near a state border, the information should be relayed to the nearest warning office, in the adjoining state.

Finding 4:

The entire North Carolina NOAA Weather Wire Service was knocked out of operation for virtually the entire time the state was ravaged by tornadoes. Since NOAA Weather Wire is the key link to the news media and hence to the general public, the complete warning/communication operation was compromised. The staff of Raleigh repeatedly phoned critical information to meteorologists at a key TV station that also operated an 82-station radio network throughout the state. NOAA Weather Radio facilities were operational during the whole event (see Recommendation 6).

Recommendation 4:

All possible back-up communications means should be explored and used when NOAA Weather Wire Service — a land-line system — fails. NOAA Weather Radio should be exploited as a warning means. Ham radio networks are another possibility. Multiple communication sources are critical and the aid of radio and television stations should be solicited. Contingency plans should be developed.

Finding 5:

Several weather service radars covered the Carolinas, including 10-centimeter network coastal radars at Wilmington and Cape Hatteras, N.C., and at Charleston, S.C., and five-centimeter local warning radars at Columbia, S.C., and Raleigh, N.C. The bulk of the warnings were issued by Columbia and Raleigh using the local warning radars. The five-centimeter radars were severely attenuated by intervening echoes that made it impossible to track the tornado-producing supercell or to ascertain severe weather signatures. In addition, the office at Raleigh cannot access the unattenuated 10-centimeter Wilmington radar because of incompatible equipment. In many cases, only severe thunderstorm warnings were issued because attenuated radars failed to identify the existence of a tornado.

Recommendation 5:

Ten-centimeter Doppler radar would help substantially in properly identifying those storms with potential for producing tornadoes. The Federal Government should continue its procurement of Doppler radar (NEXRAD Program) and push for its earliest possible installation. Offices with local warning radars should be equipped with displays from the adjacent network radars that cover their area.

Finding 6:

NOAA Weather Radio is an excellent warning and information source. At times it was the only dependable means of dissemination. The team was impressed with the time and attention devoted to NOAA Weather Radio by the National Weather Service staff. The NOAA Weather Radio broadcasters, who are contract employees, showed an admirable appreciation of the warning responsibility of the Weather Service Forecast Offices and used good judgment during critical periods. The information is timely and has the capability of reaching a great segment of an affected population. The team encountered many instances where important officials in the warning chain relied on NOAA Weather Radio for their first alert of the impending outbreak. This included broadcasters and emergency management officials. Unfortunately, there is a considerable segment of the public that is still unaware of the existence, value, and low cost of NOAA Weather Radio. The team also found portions of the tornado outbreak area where people said they could not receive NOAA Weather Radio broadcasts.

Recommendation 6:

NOAA and the National Weather Service should redouble their efforts to call attention to the existence and value of NOAA Weather Radio, especially in promoting its special tone alert for warning purposes. Gaps in the coverage should be eliminated.

Finding 7:

Forecasters at the Severe Local Storms office were outstanding in anticipating the events leading to the Carolina outbreak and handled the fast-breaking situation with great competency and initiative. Satellite information from the Kansas City Satellite Field Service Station and the use of the interactive Centralized Storm Information System proved to be invaluable in the issuances of critical watches and in monitoring the rapidly developing weather situation.

Recommendation 7:

The National Weather Service should plan for continued operation of the research-developed Centralized Storm Information System with appropriate levels of enhancement over the next several years. It should also develop and deploy systems with appropriate interactive capabilities at other National Centers and at field stations. The National Weather Service should also plan for similar capabilities at Satellite Field Service Stations and should move as soon as possible to implement satellite display systems at Weather Service Forecast Offices that will enhance the use of satellite information in recognizing severe weather potential and the ability of the Weather Service Forecast Offices to coordinate with the National Severe Storms Forecast Center. Training programs for Weather Service Forecast Offices in interpreting satellite imagery in conjunction with conventional data should be conducted.

Finding 8:

The National Severe Storms Forecast Center made two phone calls to the Weather Service Forecast Office at Columbia based on significant information derived from the Centralized Storm Information System and satellite data from the Kansas City Satellite Field Service Station. One call advised of a developing mesoscale low pressure system in Georgia; a second call concerned an intense thunderstorm identified by satellite. This information helped confirm to the staff at Columbia that it was dealing with a significant severe weather situation.

Recommendation 8:

The National Severe Storms Forecast Center should provide on a routine basis to warning offices critical information derived from the Centralized Storm Information System or from satellite concerning storm systems which have a very high potential for producing severe weather.

Finding 9:

An extremely accurate tornado watch was in effect for seven hours, covering the counties in North Carolina and South Carolina that later experienced tornadoes. While there was a paucity of tornado warnings because there were no clear radar indications or spotter reports, there were numerous severe thunderstorm warnings issued for those same areas.

Recommendation 9:

When an area is under a tornado watch, and only then, and severe thunderstorm warnings are issued, the responsible National Weather Service office should use a phrase that mentions that tornadoes can develop from the severe thunderstorms.

Finding 10:

A few tornado warnings contained the phrase "funnel cloud touching the ground." This wording is wrong. Funnel clouds by definition do not touch the ground. This phrase in fact confused one National Weather Service office and could easily confuse the public.

Recommendation 10:

National Weather Service offices should be directed to stop using this phrase.

Finding 11:

At the height of the storm in the Northeast it was difficult, and at times impossible, for disaster personnel to make rational decisions about where to concentrate their efforts aimed at protecting lives from flooding because little or no information was available from NOAA tide gauges. The gauges either did not exist in the first place or they had been rendered useless because of power outages.

Recommendations 11:

Additional tide gauges should be installed on the northeast Atlantic Seaboard. In general, tide gauges should have an emergency, back-up power source allowing them to both measure and transmit tidal height information during a commercial power failure.

Description of Outbreak

Killer tornadoes swept through northern South Carolina and eastern North Carolina during the late afternoon and evening of March 28, 1984. The location of the outbreak, away from "Tornado Alley" — the Great Plains and the Mississippi Valley — was unusual but not unprecedented. A similar disaster had occurred in South Carolina in April 1944, and a single violent tornado hit Greensboro, N. C., in April 1936. However, nothing comparable to the scale or violence of the present outbreak had struck the Carolinas since February 1884. The storm caused over $200 million in damage, leaving in its wake 59 dead, approximately 1,300 injured, and more than 3,000 left homeless. (See Fig. 1.)

National Weather Service records over the past 30 years show an average of 9-12 tornadoes annually in the Carolinas with only one death a year. The National Weather Service classifies tornadoes as weak, strong, or violent. Weak tornadoes comprise 65 percent of all reported tornadoes in the United States, but cause only two percent of all fatalities. Only two percent of all the tornadoes are of the violent type, but they account for about 70 percent of the death toll. The tornadoes that have occurred in the Carolinas through the years have been relatively weak — of the hit-and-run variety with relatively low maximum windspeeds and a small path width and length. Damage is usually light to moderate.

What follows is a state-by-state sequence of the severe weather event, which began with Georgia, a state that did not experience killer tornadoes, but that did have severe weather as the storm system developed.

Georgia

The long-lived supercell storm that spawned the vast majority of the outbreaks in the East began on the Georgia-Alabama border about 2 p.m. The storm brought damaging winds and large hail up to two and three-quarter inches in diameter as it moved across Georgia. Three short-lived tornadoes were reported with the supercell storm, including one in Barrow County at 3:30 p.m., which produced one injury and considerable damage to buildings. Seven other weak tornadoes occurred elsewhere in the state along the parent squall line.

South Carolina

The supercell crossed into South Carolina just after 4 p.m., but for the first hour produced only one weak tornado, along with some funnel clouds, winds, and hail. The first strong tornado struck Newberry about 5 p.m. causing the first fatality. Thirty minutes later a second strong tornado devastated the northern edge of Winnsboro and other parts of Fairfield County, leaving five dead. The supercell next spawned a tornado near Wateree Reservoir in Kershaw County and, although no one was killed, 23 people were injured and damage was heavy. South Carolina's final strong tornado touched down in eastern Chesterfield County just after 6:40 p.m. This tornado had a longer track, striking Bennettsville at 7 p.m. and then reappearing, probably as a separate tornado, at McColl a few minutes later. In Marlboro County there were nine fatalities, seven near Bennettsville (although there were none in Bennettsville itself) and two in McColl.

Other sections of the squall line, apart from the supercell, produced considerable severe weather. In the northwestern part of the state there were two tornadoes and damaging winds, particularly near Anderson, Greenville, and Laurens. There was a fatality in a windstorm at Fountain Inn in Laurens County. Other wind storms were scattered across the rest of the state. A severely damaging hailstorm struck the Columbia area while the supercell was in the northeast part of the state. The hailstorm interferred with the radar echo, a phenomenon known as attenuation. Attenuation causes a false weakening of a radar echo, making it difficult to interpret the actual radar echo strength beyond the cause of the attenuation, in this case the hailstorm. There was also a weak tornado in rural Horry County. All told there were 11 tornadoes in South Carolina, with 16 deaths, one from wind storms.

North Carolina

As the supercell storm entered North Carolina at 7:10 p.m., a violent tornado was on the ground, the one that had just struck McColl, S. C. The tornado struck the Robeson County towns of Maxton at 7:15 p.m. and Red Springs 10 minutes later. Three people died and almost 300 were injured. As the tornado went through Maxton, it toppled a microwave relay tower, severely curtailing statewide communications, including the NOAA weather wire (a weather teletype system that provides subscribers with a variety of weather information, including watches and warnings), and a sizeable fraction of the state telephone service.

After a short period without a tornado, the supercell storm formed a tornado that hit the unincorporated rural community of Beaverdam in Cumberland County at 7:45 p.m. Two lives were lost and whole sections of pine forest were flattened. Without a break, a new tornado formed in Sampson County and traveled through parts of Duplin and Wayne counties. This tornado was particularly violent, destroying portions of Salemburg in Sampson County, Calypso and Faison in Duplin County, and Mt. Olive in Wayne County. Damage was equally severe in rural areas of these three counties. In all, 12 people were killed and nearly 300 injured along the 36-mile path of the storm. The tornado series continued with a new, strong tornado forming as the Mt. Olive tornado dissipated. This tornado killed two people in Wayne and Lenoir counties.

The tornado with the longest track began in Lenoir County about 8:40 p.m. immediately after its predecessor had faded. The tornado traveled 38 miles through Lenoir, Green, and Pitt counties, just missing the population centers of Kinston to the north and Greenville to the southeast before dissipating about 9:30 p.m. Damage was severe in the small towns of Dawson in Green County, Ayden and Pactolus in Pitt County, and in the adjoining rural areas. This violent tornado killed 16 — the largest single death toll of any of the tornadoes — and injured more than 300.

At this stage the supercell weakened and tornado production ceased temporarily. Just before moving over the Atlantic and dissipating, the storm formed its last tornado about 10:15 p.m. in the extreme northeastern North Carolina counties of Chowan and Perquimans. This last tornado, although less intense, caused one death and three injuries, along with considerable damage.

In northeastern North Carolina a shorter-lived storm to the north of the supercell formed five strong tornadoes. The first was near Rocky Mount in Nash County at 8:10 p.m. It caused considerable damage and one injury along its short path. The second tornado struck west and north of Lewiston in Bertie County about 8:55 p.m. Damage was particularly heavy in a small neighborhood of weak frame houses and mobile homes where six people died. The next two tornadoes were in Hertford County near Ahoski and Harrellsville. There were no fatalities but considerable damage and 14 injuries. The final tornado from this storm occurred in Gates County shortly after 9:30 p.m. It killed two and injured 10.

In addition to the two tornado-producing storms just mentioned, other severe weather accompanied the squall line through the state. There were numerous reports of large hail and high wind. Also, two weak tornadoes occurred in Union County near Charlotte and a weak tornado, which moved out of South Carolina, struck Tabor City in Columbus County causing $900,000 damage but no injuries or deaths. North Carolina experienced 15 tornadoes with 44 deaths. The total number of tornadoes in the outbreak, including the three that crossed from South Carolina into North Carolina, was 23, seven of them classified as violent and 12 as strong.

Meteorological Analysis

By 6 p.m. on March 26 upper air data indicated that meteorological conditions were developing that favored the generation of severe thunderstorms across the southern United States during the next two days. A strong trough was located over the interior portion of the western U.S., with a strong jet stream maximum moving down its back side, just along the northern West Coast. Information generated by computers, so-called "numerical guidance," handled the system well through the next three days, predicting vigorous development as the system moved through the southern U.S. and then northeast toward the New England coastal region.

On March 27, the system moved through the southcentral U.S. triggering numerous severe thunderstorms — there were 96 reports of severe weather, including 15 of weak tornadoes, 20 of high winds and 61 of hail — with the majority of the severe activity in northeast Texas, northern Louisiana, and southern Arkansas (Fig. 2).

By the morning of March 28 the surface low was in western Tennessee, with a surface front trailing southward through Mississippi. Thunderstorm activity, which had moved through Alabama and Georgia during the late night, was in South Carolina and heading offshore. The 500 mb height and vorticity chart showed that while the South Carolina activity was supported by a weak short wave, the main strength of the system was to the west in Louisiana and Mississippi. It was this strong short wave that was to move through the southeast during the next 12 hours.

A composite chart from the 7 a.m. upper air data, confirmed what had been suggested with numerical model runs from the previous day: events were coming together to create a major severe weather outbreak over the southeastern United States the afternoon of March 28. At the low levels (850 mb) significant moisture was being advected into the area by a strong low level jet. Winds veered with height, and dry air was being advected over the area by a strong 700 mb jet. There was also a strong diverging jet in the layer between 500 mb and 300 mb. (Fig. 3). The strong winds aloft indicated that the short wave in eastern Texas would move rapidly eastward.

Two important features developed during the morning of March 28 that were to have a profound influence on the type of severe activity that occurred during the day. One was the formation of a strong low level (i.e., surface) convergence boundary and the other was the development of an intense small-scale low pressure system, known as a subsynoptic surface low. The thunderstorm activity that had moved through Alabama and Georgia during the late night was in South Carolina by 8 a.m. This activity had produced a well-defined outflow boundary, which extended westward from South Carolina across Georgia and into Alabama. This feature is readily detected at 8 a.m. in both a mesoscale surface analysis (Fig. 4) and GOES East satellite combined visible and infrared image (Fig 5). This boundary moved slowly northeastward during the day, ahead of the developing subsynoptic low. By 4 p.m. this feature was easily detected in satellite imagery as a line of organized cumulus congestus clouds extending across South Carolina into North Carolina (Fig. 6). The large storm in northeast Georgia lies at the junction of the convergence boundary and subsynoptic low. That storm developed into a larger supercell which tracked east northeast along the boundary producing most of the intense killer tornadoes. There was a large clear region to the north of the boundary. This clearing allowed rapid heating of the air in that region that made even more unstable the low level air mass that was to feed the supercell. The long-lived storm began on the Alabama-Georgia border about 2 p.m. and intensified as it moved rapidly across Georgia. Damage was first reported just east of Atlanta's Hartsfield Airport. The radar echo developed a bow configuration near Athens, Ga., as damage became more severe and the storm's speed increased. The storm began to produce strong tornadoes after it entered South Carolina about 4 p.m. The supercell storm was not isolated. Instead, it was embedded within a long line of storms and was situated along the southern edge of a line-echo-wave pattern.

Across the Carolinas, the echo was strong and maintained a notch on its right flank, although it did not possess a classic hook echo, except for brief instances. Radar did give some indication of storm severity because of the large echo overhang aloft, known as a low-level weak echo region, which resulted from the strong updraft. The echo was slightly weaker after moving into North Carolina about 7 p.m., but was associated with longer segments of continuous tornado damage. In northeastern North Carolina a cell to the north of the main supercell began to produce strong tornadoes. Both echoes weakened and died after moving over the Atlantic Ocean about 11 p.m. The lifetime of the tornado-producing supercell was unusually long, nine hours.

The major meteorological difference between March 28 (a long-track tornadic supercell, producing killer tornadoes and damage approaching F4 intensity, with F5 being the highest possible) and March 27 (numerous reports of severe activity, but no major tornadoes) was the existence of a well organized, low-level convergence boundary and mesolow that helped support the supercell's growth and development.

Atmospheric pressures were abnormally low even for a storm this strong as the system moved across the southern United States. By 7 a.m. on March 29 a strong coastal storm with record low pressures for the Northeast had developed.

Along the East Coast, north of the Carolinas, high winds, up to hurricane force, and high tides produced significant flooding and major beach erosion. Tides along the ocean were four to six feet above normal and reached eight to ten feet above normal in some restricted bays and inlets along Long Island's north shore and Great Peconic Bay, at the juncture of Long Island's north and south forks. In the northeast, precipitation turned to snow, sleet, and freezing rain. Snows of up to two feet and heavy accumulations of ice snarled traffic and, with the strong winds, brought about widespread power outages.

The Forecast

Great strides have been made by the National Severe Storms Forecast Center in recent years in developing and applying the most modern technology to forecast severe thunderstorms and tornadoes. Foremost has been the use of the Centralized Storm Information System. The system is an interactive meteorological satellite display system that allows forecasters to see satellite imagery in near "real time" (i.e. 30 minutes sooner than previously possible). Automation of the procedures leading to a forecast reduces the weather watch preparation time by a crucial 10 to 15 minutes. Newly developed programs have given the forecasters new tools that allow important weather-related information like moisture convergence data to be superimposed on satellite imagery.

Based on analyses of upper air data at 0000 Greenwich Mean Time, satellite water vapor and infrared imagery in animation, and surface mesoscale analysis, meteorologists at the National Severe Storms Forecast Center in Kansas City issue a forecast called a convective outlook at 0800 GMT which is valid for a 24-hour period beginning four hours later. The outlook describes geographical areas of suspected severe weather. The one issued March 28 outlined the area of severe weather well. Portions of it are given below:

> For the period 12Z to 00Z [i.e. GMT] there is a moderate risk of severe thunderstorms over portions of eastern Alabama, much of Georgia, South Carolina, and North Carolina.
> Strong surface low over western Tennessee expected to move east-northeastward and deepen during next 24 hours. Satellite indicates upper level impulse from western Tennessee into southwestern Alabama rotating around top at about 45 knots. Strong thunderstorm activity currently moving across Alabama ahead of upper vorticity maximum expected to continue moving eastward. Airmass over southeastern U. S. remains moist and unstable beneath favorable upper level diffluence. Significant thunderstorm activity from Georgia northeastward into southern Virginia where low level warm advection and convergence will be concentrated.

The analysis of the 12Z upper air data confirmed what the models had suggested from the runs on March 27, that conditions were ripe for an outbreak of severe thunderstorms in the southeastern states that afternoon. At 10 a.m. the convective outlook previously mentioned was updated using the more recent upper air observations and satellite and surface data. At that time a forecast of moderate risk was still being carried over the outbreak area. Tornado Watch #55 was issued at 11:58 a.m. for northern and central Alabama and Georgia. Because the storm was already strong and was expected to intensify further, the tornado watch contained what is known as an "enhanced wording option," designed to draw attention to the storm's potential severity. A portion of that watch is given below:

> The National Severe Storms Forecast Center has issued a tornado watch for:
> Parts of north and east Alabama
> Large part of northern half of Georgia
> From 11:00 a.m. CST until 5:00 p.m. CST this Wednesday morning and afternoon.
> *This is a particularly dangerous situation with the possibility of very damaging tornadoes.* [Italics added] Also, large hail, dangerous lightning, and damaging thunderstorm winds can be expected.

> The tornado watch area is along 70 statute miles either side of a line from 30 miles southwest of Birmingham, Alabama, to 50 miles east southeast of Athens, Georgia.

At 1:45 p.m. the Satellite Field Service Station staff meteorologists at Kansas City briefed the Severe Local Storms forecaster on the situation based on satellite data.

Around 2 p.m. conditions deteriorated even further with the low redeveloping eastward near Atlanta where pressure had dropped to a record low level. Radar cells were moving at speeds up to 60 or 70 knots.

Though the storm was still some distance from the Carolinas, the anticipated severity of the situation and the storm's high rate of speed prompted the Weather Service to issue Tornado Watch #56 at 2:14 p.m., across the Carolinas into southeast Virginia. This watch was valid for an unusually long time, seven hours, and covered a large area, 50,000 square miles, to avoid having to reissue watches during the evening when the local offices would be busiest. The 50-knot speed of the low pressure system also suggested that by the end of the watch seven hours later the storm should be close to moving out into the Atlantic.

Shortly after the issuance of tornado watch #56, the convective outlook was upgraded to high risk. Portions are given below:

> There is a high risk of severe thunderstorms through the period over portions of Alabama, Georgia, South Carolina, North Carolina, and Virginia. Major severe weather event continues to unfold. Strong low level flow of very unstable air will continue ahead of mesolow now approaching northwest Georgia. Low will move east northeastward into and along quasi-stationary boundary from near Athens to near Raleigh-Durham by early tonight.

All of the weather watches and convective outlooks were transmitted on the Automation of Field Operations, or AFOS.

While we often think of the warning system as being tiered into a tripartite watch/warning/dissemination arrangement, there are other levels of information that pass to the staff at the Severe Local Storms office and the Weather Service Forecast Offices to help them make decisions. One such important source of information comes originally from the Satellite Field Service Station. The Kansas City Field Station is responsible for passing pertinent information to the Severe Local Storms office. Satellite image interpretation information is passed to the field via Satellite Interpretation Messages (SIMS) over AFOS, telephone communication using the FTS system, and, in the case of Kansas City Field Station and the Severe Local Storms office, direct contact.

Satellite data played an important role in the watch phase of the storm outbreak. At the Severe Local Storms office and the Kansas City Field Station, the Centralized Storm Information System proved to be invaluable in monitoring this rapidly-developing severe weather outbreak. The moisture convergent field derived each hour bullseyed the strong low development and showed the high potential for dangerous weather throughout the afternoon along the boundary throughout the eastern Carolinas. The ability to construct storm watches directly on the CSIS screen greatly increased the meteorologists' confidence in locating watch areas based on features obtained from satellite imagery.

Using the 15-minute imagery from CSIS the Kansas City Satellite Field Service Station meteorologist noted that the cluster of thunderstorms approaching South Carolina was rotating and had supercell characteristics. This information, combined with that on the outflow boundary and the rapid movement of the system itself, contributed to the decision to call Columbia and influenced the upgrading of the convective outlook to high risk.

Although satellite data are not used to issue tornado warnings, information provided to the Weather Service Forecast Offices from both satellite imagery and interpretation guidance from that imagery can help draw attention to threatening weather conditions. The boundary that was so important in focusing the severe activity was referred to in both the 10 a.m. and 2:30 p.m. convective outlooks.

Community Liaison, Warning Systems and the Media

Three groups represent the core of an effective, integrated community warning system: the National Weather Service office with its local warning responsibility, state and local emergency service agencies, and the broadcast media.

While the National Weather Service has the responsibility for issuing tornado warnings, it does so only when there are positive indications by radar, through reliable reports from trained civilian observers, or from local emergency service agencies. Since radar often cannot give unequivocal indications of a tornado, the "ground truth" provided by tornado spotters and volunteer observers and local emergency agencies is indispensible to the total warning system.

Typically these emergency service agencies — civil defense, police, sheriffs' offices, and fire departments — as well as amateur radio networks are in continuous operation during a storm and are responsible for organizing and coordinating a community's response to a weather threat.

With the exception of NOAA Weather Radio broadcasts, which come directly from National Weather Service, the tornado warnings are received by the public from television and radio. Thus, the communication links between the local National Weather Service office with county warning responsibilities, broadcasters, and the other agencies are paramount for timely and accurate warnings. But even if the forecasting-reporting-dissemination chain works, lives can be saved only if there is an aware and knowledgeable public that will act responsively and immediately.

This linkage between organizations and the volunteer support of an army of concerned citizens and private groups, along with the education of spotter groups and the public at large, is what the National Weather Service calls its Community Warning/Preparedness Program. Currently there are 14 Warning/Preparedness Meteorologists assigned to the Weather Service Forecast Offices. They are all weather forecasters who ideally will spend about three-quarters of their time in preparedness-related activities and with emergency service organizations, and the broadcast media. They also recruit and train tornado spotters. But the job of preparedness is one that requires the attention and support of the entire staff of a weather office. Where there is no dedicated weather preparedness meteorologist position, the Weather Service Forecast Office designates a forecaster to act as the program leader for that activity, if and when time permits.

Of the 14 dedicated positions, 10 are in the National Weather Service's Southern Region and four are in the Eastern Region. The Columbia, S.C., Weather Service Forecast Office has had such a position for several years. The Raleigh, N.C., Weather Service Forecast Office has never had a dedicated disaster preparedness specialist. This dichotomy reflects what is an extremely uneven program throughout the United States.

South Carolina

South Carolina weather offices have had a long history of community preparedness work. Tornado awareness weeks have been an annual event for the past several years, and 1984 was no exception. From February 26 to March 3, an awareness program was in full swing. Schools and other institutions held tornado drills, and there was an educational campaign to keep people aware of the dangers of severe weather. The following account of what happened in Bennettsville, S.C., illustrates the value of strong ties among the National Weather Service, the news media, and state and local governments.

Bennettsville, South Carolina
A Case Study of a Prepared Community

Bennettsville is a friendly community of 9,000 located in Marlboro County of northeastern South Carolina, 80 miles from the capital of Columbia. Cotton and light industry form the economic base for the community. The city has two newspapers, the Marlboro Herald Advocate and the Fine Print News, and a 10,000-watt radio station, WBSC, which broadcasts from a studio five miles from the downtown area.

Bennettsville has been emphasizing disaster preparedness for more than 10 years, and on March 28 it paid off. A strong tornado with winds estimated at near 200 miles an hour struck Bennettsville shortly after 7 p.m., eastern standard time. The storm destroyed a shopping center and heavily damaged two apartment complexes and a middle-to-upper income neighborhood. The ferocity of the tornado was vividly demonstrated by a 28-foot long, one-foot-wide steel I-beam in the front yard of a home, one quarter of a mile from a carport where it had been picked up. The beam, standing almost vertically, was imbedded six to eight feet in the ground. Although there were nine fatalities in Marlboro County, seven of those in mobile homes, there were no deaths in Bennettsville. Preparedness was the key to saving lives.

The Weather Service Forecast Office in Columbia, S.C., working with the state, held a tornado preparedness week February 26 through March 3. In Bennettsville, the Marlboro Herald Advocate published two articles and one editorial about tornadoes and tornado safety as part of the preparedness week. Radio station WBSC played about 125 public service announcements dealing with severe weather during the same period. The public schools held tornado drills instructing children on how to move into the halls and assume a crouched position with their heads on their knees. Educational material on tornadoes was made available to the schools by the town's part-time local emergency management official.

On March 17, just 11 days before the storm, Bennettsville held a disaster drill that simulated an airline crash, complete with "victims" and all aspects of emergency management in a crisis. Local officials later said the disaster drill enabled the city and surrounding communities to respond quickly and deliberately when the tornadoes hit.

The town also uses its fire siren to alert residents about severe weather. The fire siren sounds for two minutes and rests for three minutes during a 30-minute cycle to announce a tornado watch is in effect. If a tornado warning is issued, the siren sounds for three minutes and rests two minutes for a period of 30 minutes. Considering South Carolina averages only nine tornadoes a year and one fatality, this preparedness effort is extraordinary.

Shortly after 2:30 p.m. on March 28, the fire station sounded the siren for a tornado watch. City residents had heard the siren many times before, and although they were not overly concerned, their level of awareness had already been elevated and they were ready to respond. WBSC radio carried the tornado watch throughout the afternoon. The station broadcast a pre-recorded tape on safety rules during the afternoon, and the station's disc jockey broadcast safety rules, the tornado watch, and weather information recorded from NOAA Weather Radio in Florence, S.C., which originates from the Weather Service Forecast Office in Columbia.

At 6:25 p.m., the Weather Service Forecast Office in Columbia called the state Emergency Operations Center at Columbia to advise it that a severe thunderstorm was moving into Marlboro County. The state Emergency Center, in turn, contacted Bennettsville's local emergency management official who called the fire station. At 6:32, less than 10 minutes after the initial Weather Service call had been made, the siren for a tornado warning sounded in Bennettsville. The warning continued until the tornado hit, just after 7 p.m. WBSC had received a tornado warning on the NOAA Weather Wire for Marlboro County, which was issued at 6:53 p.m. It was read over the air shortly before a power failure put the station off the air at 7:10 p.m.

Because South Carolina is not a tornado-prone area, not everyone heard the sirens or was fully aware of what they meant. Nevertheless, many of the people in Bennettsville did take protective action in those few precious moments just before the tornado struck. They went into halls or closets, covered themselves with mattresses, or crouched under sturdy pieces of furniture. Two brick apartment buildings collapsed, yet the occupants survived because they got under something. In fact, three women in one of the devastated apartments crawled out of the rubble without a scratch. A six-year-old boy at the shopping center dashed into a store, got under a counter, and crouched down with his head on his knees, something he had learned in school during preparedness week. That action saved his life. Patients at the Dundee Nursing Home were moved into hallways when the fire sirens warned of severe weather. Although the nursing home was untouched by the twister, the actions of the staff were commendable. Under a different set of circumstances such precautions could have saved lives. Interviews with the town's residents revealed that children had learned in school what to do during severe weather and passed that information on to their parents when the weather began to deteriorate.

The community responded quickly to the disaster, and within two hours Fire Chief Jerry Raley set up a command post at the shopping center and coordinated the rescue efforts of 330 men and 70 vehicles throughout the night and well into the next day. The cooperative preparedness actions in Bennettsville were crucial. The action of the National Weather Service in Columbia, the coordination developed among the Weather Service, the state agencies, and local governments, and the concerns of the citizens of Bennettsville all contributed to saving lives in the city.

* * *

In spite of the exemplary work in Bennettsville, continuous staff shortages in the last four years are having an impact on the community liaison efforts. Since 1980, the Columbia weather office has carried a full staff for a total of only eight weeks. The remainder of that time, there has been at least one vacancy, and about 50 percent of the time, the office has had two or more vacancies. In fact, during almost all of 1981, the warning/preparedness meteorologist position was vacant.

When offices are short on staff, the warning/preparedness meteorologist as well as others on the staff must fill in on operational shifts. This prevents the staff from conducting community preparedness work. At Columbia, the warning/preparedness meteorologist spent only about 30 percent of her time doing preparedness work in the past year because of having to fill in on operational shifts. In addition, she has been assigned preparedness duties in North Carolina. Not enough time is available in South Carolina for preparedness, and she has the impossible task of trying to coordinate community liaison efforts in North Carolina.

The lack of time to devote to this program has prevented the staff from recruiting, training, and maintaining an active spotter organization. Although a loose net of spotters exists in the state and it provided some critical information on March 28 in northeast South Carolina, a stronger and better-trained network is needed.

North Carolina

The situation in North Carolina is even more critical. North Carolina does not have a dedicated warning/preparedness meteorologist. The South Carolina warning/preparedness meteorologist is only able to make two to four trips a year to North Carolina. To illustrate the seriousness of the problem, the forecaster at the Raleigh Weather Service Forecast Office, who acts as a focal point for preparedness, had to work the midnight shifts during the 1983 spring awareness week because of staff shortages. In addition to no warning/preparedness meteorologist, Raleigh had staff shortages over the last four years similar to Columbia's. From 1980 through 1984, Raleigh had at least one vacant position; about 40 percent of the time there were two or more vacancies. To complicate matters further, one of the staff members has been occasionally detailed to other offices, and one member of the staff is in a work/school program. This takes critical time away from liaison work.

The problem is compounded because North Carolina is a large and populous state. There is a serious hurricane problem on the coast, and the mountainous areas have a high flash flood potential. Again, spotter networks are lacking because there simply is no time for recruiting, training, and maintaining spotter networks.

The Weather Service Field Office at Raleigh has done an excellent job of establishing and maintaining close working relationships with State Emergency Management officials and the media within its immediate area. However, staff shortages have prevented the Raleigh office from establishing ties with local officials and the media in many of the more distant counties within the office's warning area.

The Warnings — South Carolina

The first tornado warning issued by the Weather Service Field Office in Columbia was for Newberry and Saluda Counties at 4:45 p.m., until 5:45 p.m. A tornado was reported at Newberry in Newberry County around 5 p.m. The tornado warning was based on a Weak Echo Region radar signature on the Columbia radar over Greenwood County.

Due to the loss of the tornado signature on radar and lack of current reports, the downstream warnings were issued as severe thunderstorm warnings for Fairfield and Chester counties at 5:07 p.m. The attenuation of the 5-cm radar at Columbia hampered detection of the tornado-producing mesocyclone as it passed to the north of Columbia. There was a lack of timely spotter reports of tornadoes from Newberry to Winnsboro, but widespread power outages in the Newberry area may have contributed to this. Seven other severe thunderstorm warnings were issued by the Weather Service Field Office in Columbia for counties in central and eastern South Carolina. Severe thunderstorm warnings for Chesterfield and Marlboro Counties near the North Carolina border were changed to tornado warnings at 6:53 p.m., based on spotter reports. A violent tornado struck the town of Bennettsville around 7 p.m.

During the storm three weather offices issued a total of 21 severe weather statements. Some statements mentioned tornadoes were possible.

Tornado warnings were issued prior to touchdowns at Newberry and Bennettsville with lead times of 15 and seven minutes, respectively. The tornadoes at Winnsboro in Fairfield County, in Kershaw County, and at Cash, in Chesterfield County, occurred while severe thunderstorm warnings were in effect.

The weather offices in South Carolina were remarkably well aware of the potential for severe weather. The following message to all weather offices in South Carolina from Columbia illustrates their concern:

> NATIONAL SEVERE STORMS FORECAST CENTER CALLED TO SAY ALL PARAMETERS FOR SEVERE THUNDERSTORMS/TORNADOES HAVE BEEN MET OR EXCEEDED IN THIS MESO LOW.
> PRESSURE TO BREAK RECORDS AT COLUMBIA.
> MESO LOW LOCATED WEST SOUTHWEST OF ATLANTA AT 18Z [i.e. 1800 GMT]...OVER ATLANTA AT 20Z FORECAST TO BE JUST PAST ATHENS AT 22Z AND PAST ANDERSON AT 00Z.
> EXAMINE ALL CELLS CLOSELY AND BE READY TO FIRE.
> BEST TO WATCH LEVEL 5 TO 25 THOUSAND FEET. IF NECESSARY STAY IN TOUCH WITH ATHENS AFTER IT HAS PASSED THEIR AREA.
> ATTN: RADAR OPERATOR AT CHARLESTON. BE PREPARED TO SUPPLY INFORMATION ON CELLS WEST AND NORTHWEST OF COLUMBIA.
> LOWE

The large number of accurate severe weather statements and warnings issued demonstrated both the quantity and quality of work at all weather offices.

The severe weather messages including watches, areal outlines, updates of zones, and state and local forecasts were all transmitted over the South Carolina Weather Wire. Watches and warnings were distributed over the Federal Emergency Management Administration's National Warning System.

The National Warning System is a party line network of telephone circuits connecting more than 1500 state and federal warning points throughout the United States. Although NAWAS is a national system, its day-to-day operations are under the control of the individual states. Both South and North Carolina permit the National Wcther Service to use NAWAS circuits for watches and warnings. As a result, the system can reach a vast number of community officials and communications facilities, which, in turn, can fan out warnings. Many Weather Service offices also use NAWAS to get reports of tornadoes and other severe weather information. In South Carolina, the National Warning System has not yet been used to solicit severe weather reports. Since ground-truth reports are necessary to complement radar data, an effort to expand the use of the National Warning System would improve the warning program.

Extra staff was called back to work and worked with the state Emergency Preparedness Division and several county officials before the storms moved into the area. There was also coordination with several military bases within the state. NOAA Weather Radio and Weather Wire worked throughout the storm. The Emergency Broadcast System was activated for each tornado warning.

The Warnings — North Carolina

Several communications problems complicated the warning process in North Carolina. As one of the tornadoes crossed the North Carolina border around 7:15 p.m., it destroyed a microwave tower in Maxton. As a result, the North Carolina NOAA Weather Wire that serves the southeastern part of the state went out of service and was not restored until around 9:20 p.m., after virtually all of the tornadoes had passed through the state. In addition, telephone service was intermittent for part of the storm. A dedicated line between Raleigh and Wilmington was out and Wilmington was unable to use its dial backup because that equipment, too, had failed. Raleigh and other weather station offices had to issue much of what Wilmington should have been able to issue but could not. Not surprisingly, this increased an already extreme workload at Raleigh.

The first 13 warnings issued in North Carolina were for severe thunderstorms. The state's first tornado warning was issued for Wake County at 8:58 p.m., but this turned out to be based on a false tornado report. Tornado warnings were issued at 9:30 p.m. and 9:43 p.m. for several counties in northeastern North Carolina some of which had already been hit by tornadoes, by the time the warnings went out.

The severe thunderstorm warning for Scotland and Robeson counties along the South Carolina border had 10- to 15-minute lead times. This warning was issued a few minutes before the tornado warning was issued for Marlboro County just across the state line in South Carolina. The forecaster at Raleigh received the tornado warning for Marlboro, but because the wording was imprecise, thought it was based on a funnel cloud report. Since the Raleigh and Wilmington radar operators did not detect a tornado signature and checks into the area did not produce reports of tornadoes, the severe weather coordinator at Raleigh did not upgrade the severe thunderstorm warning to a tornado warning.

In all, 15 severe thunderstorm warnings were issued for North Carolina, most of which provided advance warning for those storms. Six tornado warnings were issued, but many not sufficiently early to provide useful advance warning.

The Weather Service Office at Wilmington issued five severe thunderstorm warnings. The main tornado damage track lay across northern Sampson County and along the northern border of Bladen and Duplin Counties. Thirteen severe weather statements were issued. Radar was closely monitored during the storm. However, neither the radar operator nor the meteorologist in charge could discern radar indications of a tornado.

Wilmington's Weather Service Office lost its NOAA Weather Wire, AFOS lines, National Weather Warning System phone and some telephone lines intermittently during the storm. Wilmington maintained close coordination with the Weather Service Forecast Office in Raleigh, relaying surface and radar observations to Raleigh, Cape Hatteras, and Charleston as phone lines began to work again, and had Raleigh enter warnings issued at 7:55 p.m., 8:30 p.m., and 10 p.m.

The weather offices in North Carolina were aware of the potential for severe weather and disseminated the information in their public releases. Coordination was made between offices and each acted as backup for its neighbors. As in South Carolina, the lack of timely spotter reports from ground observations as well the dearth of radar indications of possible tornadoes prevented recognition of the supercell and mesocyclone that was to produce the extensive damage across eastern North Carolina. North Carolina's radar problems mirrored those of South Carolina: attenuation of the 5-cm radar at Raleigh seriously hampered detection of the mesocyclone as it passed to the south of Raleigh.

The required severe weather messages, including watches, areal outlines, updated zones, state and local forecasts, were all sent over the North Carolina Weather Wire until its failure following the crippling of the Maxton transmission tower at 7:15 p.m. Watches and warnings were disseminated over NAWAS, but as in South Carolina, NAWAS was not used to receive severe weather reports.

Extra staff was called back to work and coordination was completed with state preparedness agencies and various local officials.

NOAA Weather Radio worked throughout the storm and was a main channel — and sometimes the only channel — of dissemination during the storm.

Media — South Carolina

A sample of major radio and TV media revealed that the tornado watch was aired promptly that afternoon. Stations recognized the potential danger of the situation and highlighted weather information on late afternoon and early evening newscasts even before the storm affected their broadcast areas. Many stations told their audiences to remain alert and to expect program interruptions in case bad weather developed.

During the event, key Emergency Broadcasting System relay stations cooperated fully in disseminating warnings. Many stations used the crawl technique of superimposing written warnings on the screen while a program was in progress for warnings and for other significant information, and some used tone-alert features similar to those on National Weather Radio. When warnings were issued, most stations broke into regular programming, including network shows, and used the event as the lead news stories or devoted entire newscasts to the event. Immediate dispatch of local news crews to the damage scenes was common and included aerial coverage by several major stations.

There was widespread cooperation by the media just prior to and during tornado awareness week held in late February and early March. This included frequent interviews, promotional spots on safety rules and facts about severe storms, and participation in statewide tornado drills. Tornado awareness week also included a statewide Educational TV live call-in show featuring the meteorologist in charge, the warning/preparedness meteorologist, and the state Emergency Preparedness representative.

Media — North Carolina

In North Carolina television and radio broadcasts of the National Weather Service severe weather warnings were severely hampered because of the outage of the NOAA Weather Wire Service. In some cases radio and television had their own communication failures. But because of the broadcast of excellent and early tornado watches, the general popular awareness of severe weather potential was heightened by frequent use of crawls by TV stations, including use in several instances of safety rules broadcast by both television and radio.

When the Weather Wire was knocked out, the Raleigh Weather Service Field Office kept the "Weather Center" at WRAL-TV in Raleigh informed of all severe storm issuances at 10- to 15-minute intervals until the Weather Wire was restored. The WRAL "Weather Center" is staffed by two professional meteorologists, who have the capability and authority to interrupt programs during tornado and thunderstorm warnings, a method they find much more effective than the cumbersome, time-consuming preparation of a crawl. The splendid cooperation between the Weather Service Field Office in Raleigh and the WRAL "Weather Center" is significant because of the wide WRAL audience, 365,000 viewers between 6 p.m. and 7:30 p.m., and 245,000 during the remainder of the prime time hours. The WRAL meteorologists broadcast tornado safety advice during the 6 p.m. news broadcast. In addition, they provide meteorological broadcasts over the affiliated North Carolina News Network, which serves 82 radio stations throughout the state. According to the operations director of the radio network, 27 of the stations — mostly full-time stations with large listening audiences — broadcast to the areas where the tornadoes occurred. He also estimated that about 40 percent of all radio stations in the network use NOAA Weather Radio and its tone-alert capabilities to alert themselves to severe weather. Weather forecasts are broadcast over the network nine times daily and severe weather is also handled during the newscasts.

Many of the people the team interviewed could identify the broadcast stations they were listening to during the day and evening hours. In addition to WRAL in Raleigh, and WPTF-TV in Durham, key TV stations were Greenville (WNCT-TV), New Bern (WCTI-TV), Washington (WITN-TV), and Fayetteville (WKFT-TV). They broadcast tornado watch and severe weather statements throughout the afternoon with frequent use of the crawl and broadcast of safety instructions. The meteorologist at WCTI-TV in New Bern, covering eastern North Carolina and using the station's satellite and radar equipment, kept his evening audience as fully informed of severe weather as possible without the benefit of NOAA Weather Wire or phone contact with the National Weather Service. There were frequent live interruptions of prime-time shows, with updates and tornado safety instructions.

The ties between the broadcast media and both the Weather Service Field Offices and the Weather Service Offices in North Carolina are generally quite good. But where theses broadcast and weather facilities are not co-located, these links need to be strengthened. This requires regular coordination visits by the National Weather Service staffs to those TV and radio stations in the more distant counties, as well as encouragement by the National Weather Service for broadcast personnel to visit the Weather Service offices.

The full extent of the tornado outbreak in North Carolina was not known to the news media until the next morning. Various members of the news media told the team that they believed that a large part of the problem was that "North Carolina just isn't considered by its people to be tornado country." A spokesman for the state emergency response team agreed that broadcasts of severe weather watches "tend to go in one ear and out the other."

Their comments are confirmed by a 10-year tornado study conducted by the National Severe Storms Forecast Center in Kansas City. The study showed that from 1971 to 1980 in North Carolina there were 156 weak tornadoes, 35 strong ones, and only two isolated, violent occurrences. In South Carolina there were 70 weak tornadoes, 30 strong ones, and again, just two violent twisters. Compare this against tornado-prone Mississippi during the same interval: 125 weak tornadoes, 163 strong ones, and 14 of the violent tornadoes similar to those that occurred in the Carolinas on March 28. The infrequency of killer-type tornado outbreaks, along with spotter and communications problems, were crucial factors during the evening of the 28th.

(N.B. Pictures of the damage caused by the Carolina tornadoes appear in the March 1984 issue of Storm Data, published by the National Climatic Data Center, Ashville, N.C.)

Coastal Marine Section - Disaster Survey Report

Although the tornadoes that brought destruction and death to the Carolinas finally dissipated, the storm's enormous energy was far from over. The system continued northeast, along the coast, bringing with it high winds and dropping heavy, wet snow on parts of New York, New Jersey, Pennsylvania, and New England. The storm also downed power lines, scoured beaches, and flooded homes and businesses. Partially because the storm spawned no more tornadoes and partially because of the forecasting and warning job carried out by the National Weather Service, there was far less loss of life in the Northeast. Four persons died at sea off Long Island and two persons were killed by falling tree limbs in Washington, D.C. Property damage, however, was considerable. Various estimates of damage in the mid-Atlantic and New England states ranged from $100 million dollars to as much as $500 million.

Serious damage occurred on March 29 along the entire New Jersey coast, particularly the barrier islands, and along parts of Long Island, New York. Tides were from four to six feet above normal, although, as aready noted, parts of Long Island's north shore saw tides eight to ten feet above normal. In New Jersey, beach erosion ranged from slight to severe. Many homes and businesses were damaged or destroyed with marinas particularly hard hit. A number sustained losses to boats and equipment. Estimates of damage in New Jersey ranged from $120 million to $125 million. Damage on Long Island was put at about $70 million. Most of the damage was caused by the wind-driven storm surge superimposed on the normal tides. Fortunately, the storm occurred during a period of low astronomical tides for the month.

The Atlantic City, Philadelphia, and New York Forecast Offices all preformed well before and during the storm. There was high praise for the timliness and quality of information relayed by these offices to disaster preparedness officials, the media, and public officials

There is extensive marine activity in Massachusetts, Connecticut, and Rhode Island, and a keen popular reliance on coastal marine weather forecasts. The Weather Service Forecast Office in Boston did an outstanding job in its analysis and forecasting for the storm. The 3:30 a.m., Wednesday, Offshore Marine Forecast, which headlined a storm warning for Wednesday night with winds of 40-50 knots, was heeded and practically the entire fishing fleet remained in port. Those at sea immediately headed for safe harbor. These forecasts were timely and very effective. They undoubtedly saved lives and vessels.

Not surprisingly power failures due to downed lines were a major problem in these three New England states. The electric companies reported their most severe power loss in 20 years. The Weather Service Office in Blue Hill, Mass., reported wind gusts to 108 miles per hour. Near Worcester, Mass., a downburst occurred that destroyed three to four acres of 8- to 20-inch diameter trees, shearing them off 10 to 20 feet above the ground.

The Weather Service Forecast Office in Boston and Weather Service Offices in Worcester, Mass.; Providence, R.I.; Hartford, Conn.; and Bridgeport, Conn., did a superb job of warning the public of the storm. There were no criticisms voiced during interviews with the Office of Emergency Management agencies, the broadcast media, business leaders, or the public.

AFOS at the Boston Weather Service Forecast Office worked very well during the entire period. However, the Providence Weather Service Office experienced a complete failure of its AFOS system Thursday morning and was out of service for about two hours. There were also several minor, short-duration failures during the day because of power fluctuations. NOAA Weather Radio at Boston failed because of a power outage at the Blue Hill transmitter.

Extensive beach erosion — the second worst on record — occurred Wednesday evening and Thursday morning on the Maryland and Delaware sections of the Delmarva Peninsula. There was some street flooding near the beaches. In Virginia, beach erosion affected only the extreme northern part of the state at the Assateague Island National Seashore. There was also significant tidal flooding Thursday morning in Virginia's northern Accomack County on the bayside of the Delmarva Peninsula.

Public weather forecasts, telephone logs, and other records show the Weather Service Forecast Offices and Weather Service Offices performed their mission commendably during this storm. Forecasts and warnings were issued as far in advance of the storm as the state of meteorological science permits. Care was taken in evaluation of the National Meteorological Center's guidance products, which proved to be very accurate. Cooperation with disaster preparedness persons was excellent. There was no known criticism of the performance of the National Weather Service or of its products.

There were, nevertheless, problems, some potential, some actual. There is a need for emergency power at tide gauges, independent of commercial power during a storm, that will provide radio telemetry to the Weather Service Office. Tide guages must be reliable during a storm, when they are needed most, to be effective. Additional preparedness work with TV and radio stations would be helpful in emphasizing the importance of forecasts for major storms in their broadcasts.

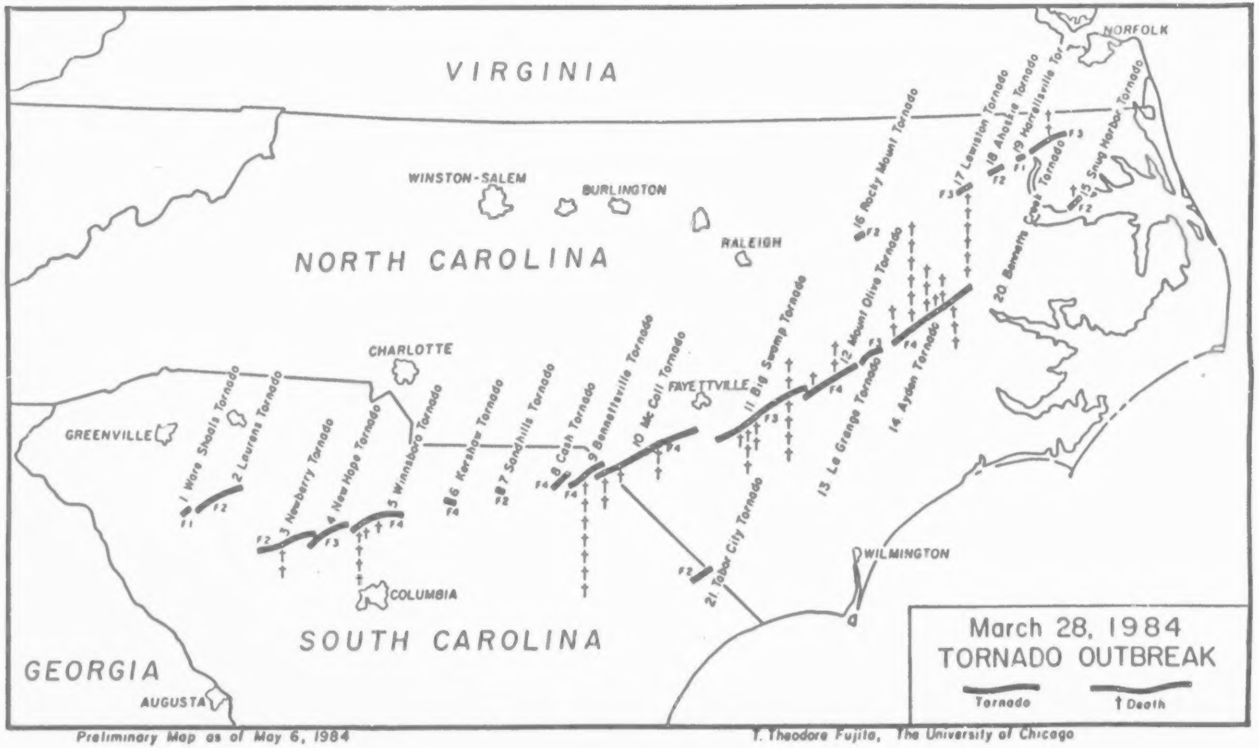
Warnings and Lead Times by County

County	Issuing Office	Warning Issued	Type of Warning	Tornado Start Time	Lead Time (minutes)
			South Carolina		
Newberry	Columbia	4:45 p.m.	Tornado	5:00 p.m.	15
Fairfield	Columbia	5:07 p.m.	Severe storm	5:20 p.m.	13
Kershaw	Columbia	5:40 p.m.	Severe storm	5:40 p.m.	00
Chesterfield	Columbia	6:14 p.m.	Severe storm	6:40 p.m.	26
Marlboro	Columbia	6:5[illegible] p.m.	Tornado	6:50 p.pm	-03
			North Carolina - First Storm Track		
Scotland	Raleigh	7:00 p.m.	Severe storm	7:10 p.m.	10
Robeson	Raleigh	7:00 p.m.	Severe storm	7:15 p.m.	15
Cumberland	Raleigh	7:30 p.m.	Severe storm	7:40 p.m.	10
Sampson	Wilmington	7:55 p.m.	Severe storm	7:55 p.m.	00
Duplin	Wilmington	8:30 p.m.	Severe storm	8:20 p.m.	-10
Wayne	Raleigh	—	—	8:25 p.m.	—
Lenoir	Raleigh	9:00 p.m.	Severe storm	8:40 p.m.	-20
Greene	Raleigh	9:00 p.m.	Severe storm	8:55 p.m.	-05
Pitt	Raleigh	9:00 p.m.	Severe storm	9:00 p.m.	00
Greene	Raleigh	9:30 p.m.	Tornado	8:55 p.m.	-35
Pitt	Raleigh	9:30 p.m.	Tornado	9:00 p.m.	-30
Chowan	Norfolk	10:15 p.m.	Tornado	10:15 p.m.	00
Perquimons	Norfolk	—	—	10:24 p.m.	—
			North Carolina - Second Storm Track		
Nash	Raleigh	8:10 p.m.	Severe storm	8:10 p.m.	00
Bertie	Raleigh	9:00 p.m.	Severe storm	8:50 p.m.	-10
Hertford	Raleigh	9:00 p.m.	Severe storm	9:15 p.m.	15
Gates	Norfolk	10:15 p.m.	Tornado	9:30 p.m.	-45

Lead times shown are minimum lead times, reflecting the length of time between the issuance of a warning in a particular county and the time a tornado was first reported to have touched down in that county. Typically, even with a fast-moving storm such as this one, there may be an additional 15 to 20 minutes lead time for those living downstream of the storm's track.

Counties where warnings were issued but no events occurred are not listed.

Tornado Track Showing Cities or Towns
Where Damage or Deaths Occurred
Figure 1


VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
NORFOLK
WINSTON-SALEM
BURLINGTON
RALEIGH
CHARLOTTE
FAYETTVILLE
GREENVILLE
COLUMBIA
AUGUSTA
WILMINGTON
1 Ware Shoals Tornado
2 Laurens Tornado
3 Newberry Tornado
4 New Hope Tornado
5 Winnsboro Tornado
6 Kershaw Tornado
7 Sandhills Tornado
8 Cash Tornado
9 Bennettsville Tornado
10 Mc Coll Tornado
11 Big Swamp Tornado
12 Mount Olive Tornado
13 La Grange Tornado
14 Ayden Tornado
15 Snug Harbor Tornado
16 Rocky Mount Tornado
17 Lewiston Tornado
18 Ahoskie Tornado
19 Harrellsville Tor
20 Bennetts Creek Tornado
21 Tabor City Tornado
F1
F2
F3
F4
March 28, 1984
TORNADO OUTBREAK
Tornado
Death

Preliminary Map as of May 6, 1984

T. Theodore Fujita, The University of Chicago

Tornado intensity (e.g. F 2) shown on a scale where F 0 = weakest, F 5 = strongest.

Figure 2

Storm Activity March 27-29, 1984
Showing Surface Low Pressures in Millibars

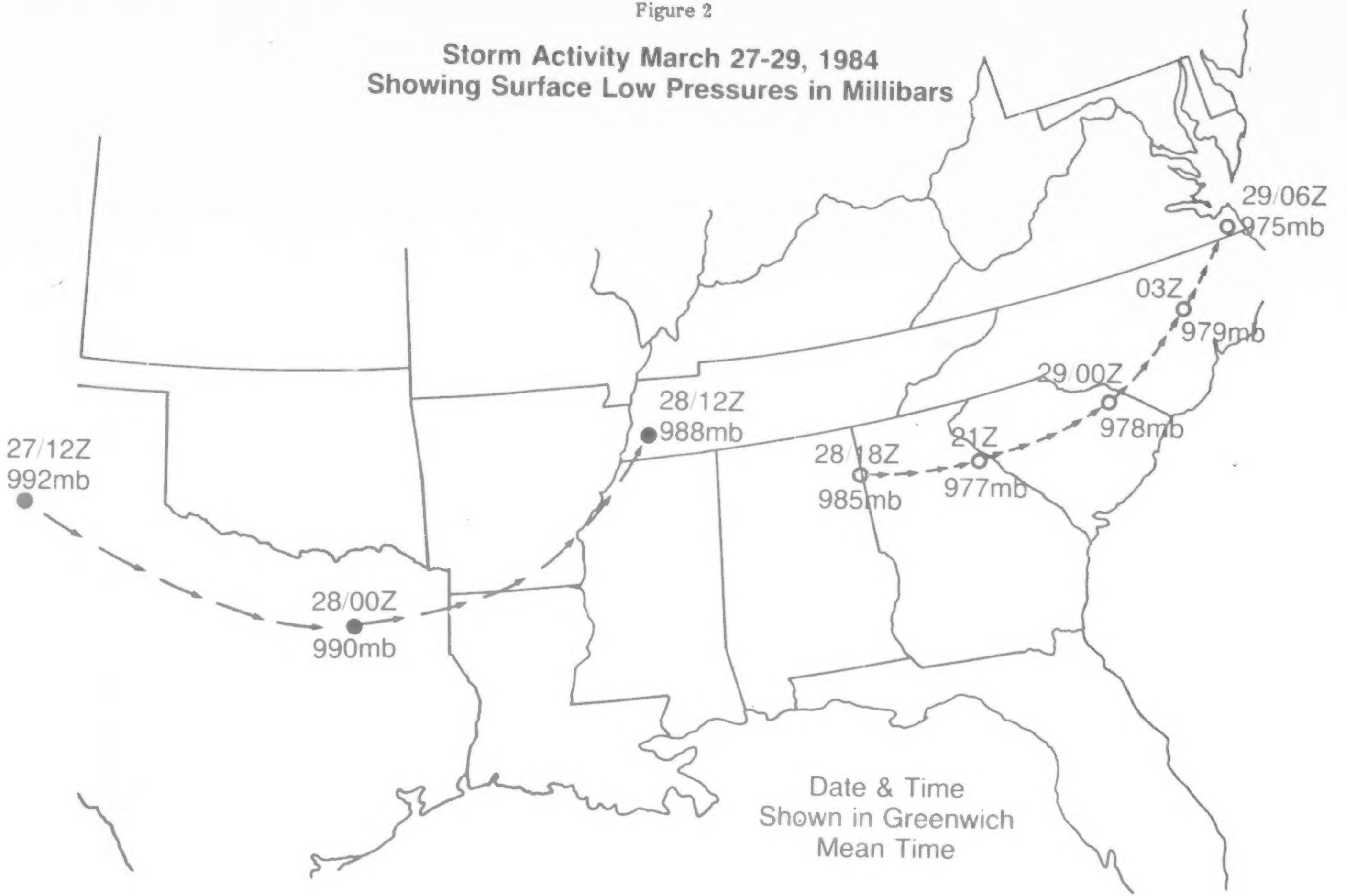

27/12Z
992mb
28/00Z
990mb
28/12Z
988mb
28/18Z
985mb
21Z
977mb
29/00Z
978mb
03Z
979mb
29/06Z
975mb
Date & Time
Shown in Greenwich
Mean Time

Figure 3

Storm Activity March 28, 1984

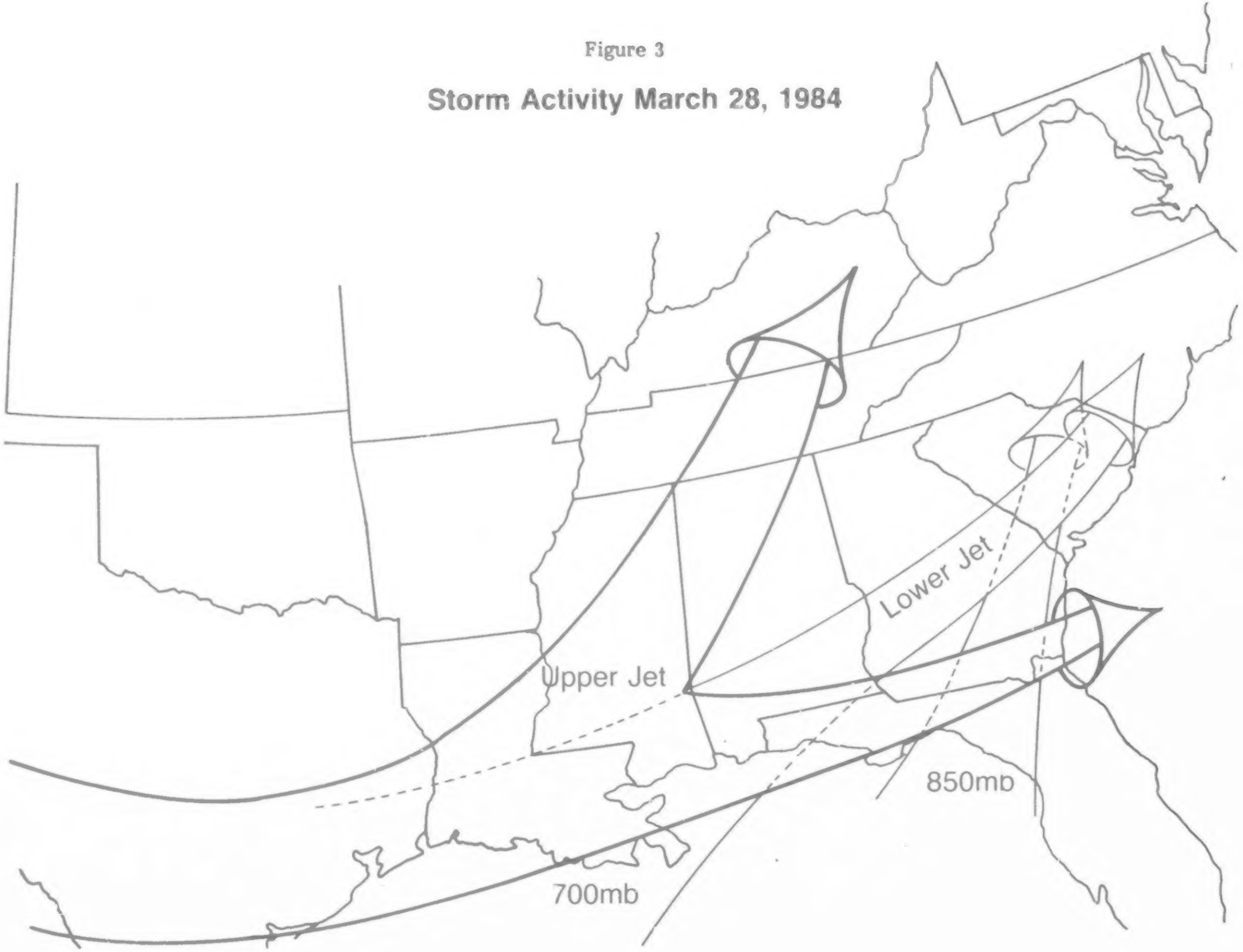
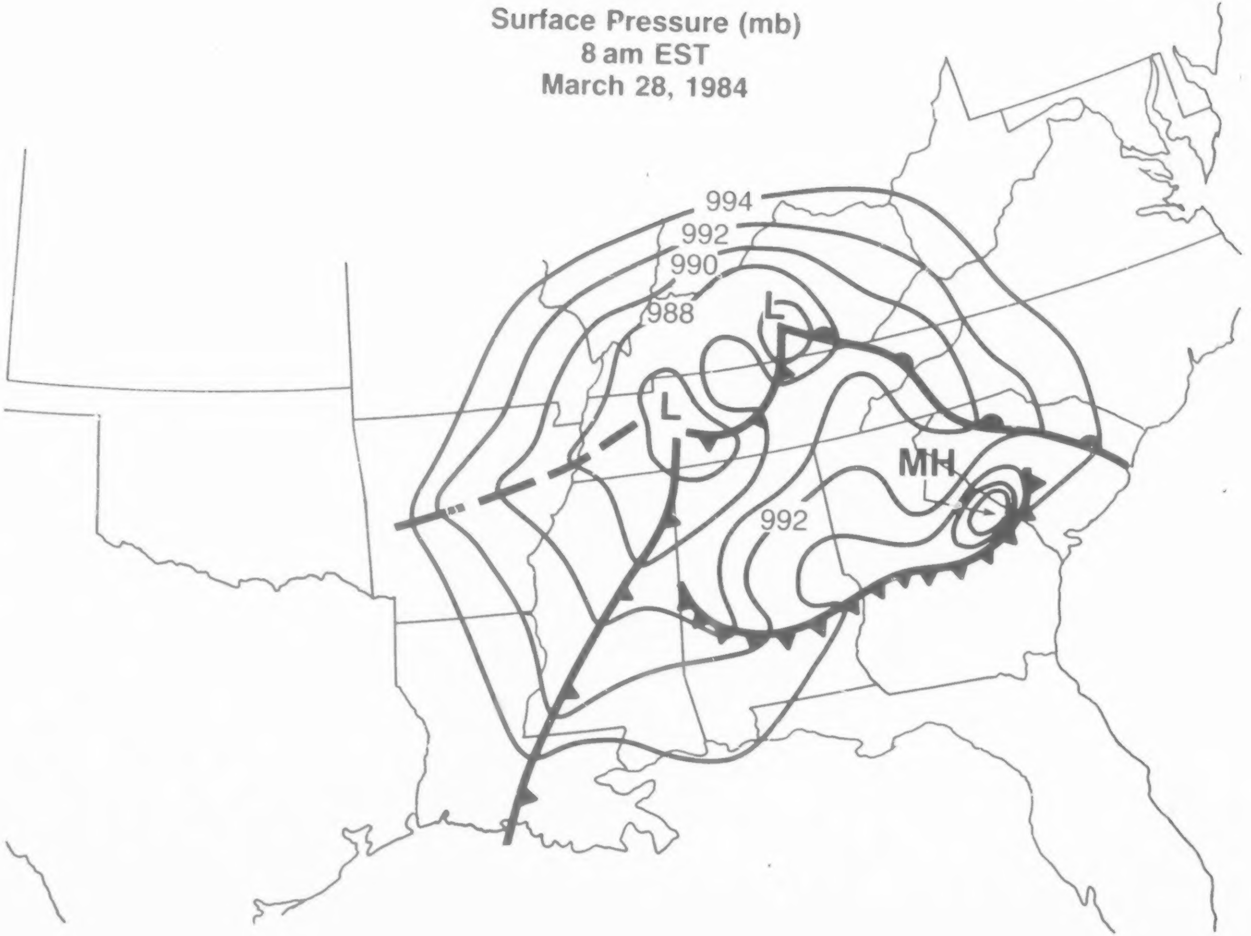
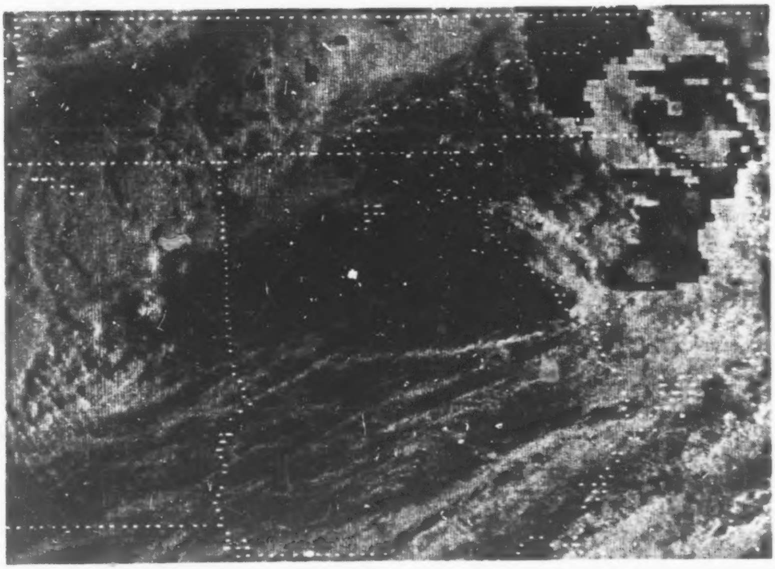

Lower Jet
Upper Jet
850mb
700mb

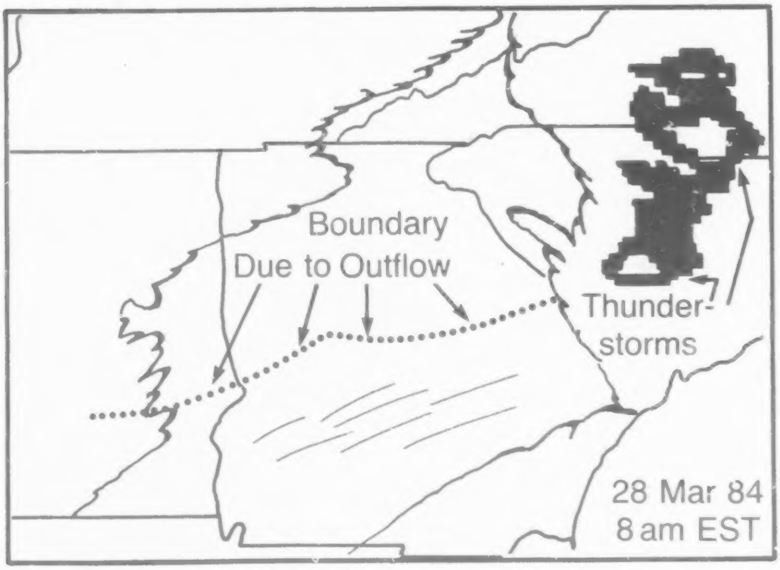
Figure 4

Surface Pressure (mb)
8 am EST
March 28, 1984

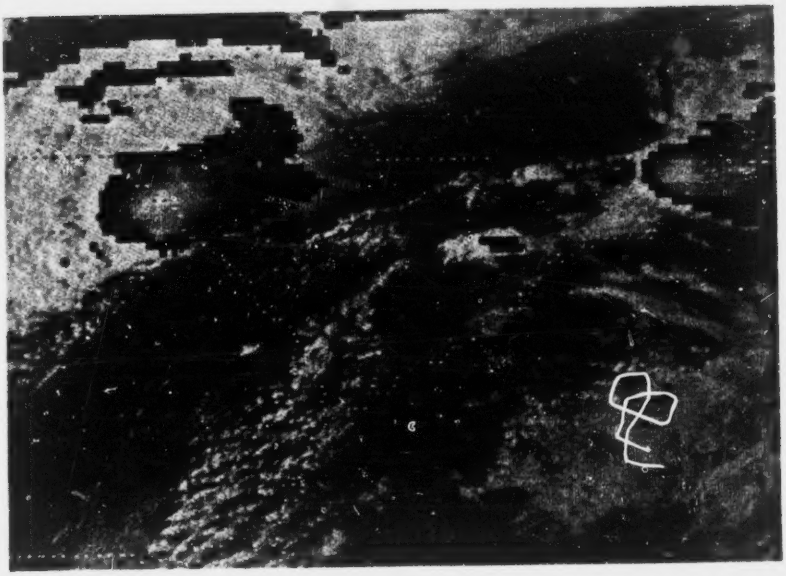

994
992
990
988
L
L
MH
L
992

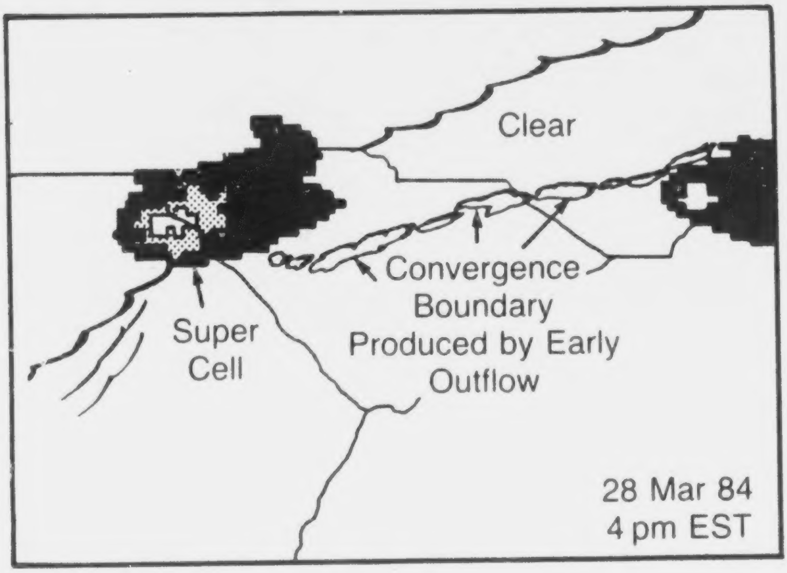
GOES East Satellite Image
Figure 5




Boundary
Due to Outflow
Thunder-
storms
28 Mar 84
8 am EST

GOES East Satellite Image
Figure 6





Clear
Super Cell
Convergence Boundary Produced by Early Outflow
28 Mar 84
4 pm EST

Mr. VALENTINE. Thank you very much, Mr. Campbell.

Let me ask you, Dr. Schneider, just one question. In connection with this natural disaster survey team which you headed, I assume that that is a—is standard operating procedure with the Government in disasters—or following disasters of this kind. Can you tell us whether or not the significant operational changes have in the past resulted from this type of survey?

Dr. SCHNEIDER. Whenever the——

Mr. VALENTINE. When appropriate.

Dr. SCHNEIDER. When there is a major storm such as this one, a flash flood, a hurricane disaster, NOAA goes through this type of exercise. And in each of these cases, we go about—in this particular case, we had over 10 rather substantial recommendations that we would like to make.

Dr. Friday, the Deputy Director of the National Weather Service, will be speaking later on the specific things that we did in this report.

In the past, yes, I have seen the changes that have taken place. In other cases, the changes haven't been as rapid as we would like to—like to do them.

However, in this case, from my standpoint as being the—an official observer and really not part of the system, per se, and seeing how the Weather Service has responded to this particular event, I think when Mr. Friday presents his testimony and you get to ask him questions, you should be quite pleased that the Weather Service has been responsive to the problems that we have raised in this particular report.

These are learning experiences for us. When you have a gigantic flash flood out in the West and you lose quite a number of lives, or when you have a large hurricane or a large tornado, we sit and learn from each of these incidents so that we won't have something like this happen again.

In this particular case, our national severe storm group in Kansas City did an outstanding job; the people in the Weather Service and our computers and things like that did a wonderful job; and the area where we have to work more closely—and you'll see evidence of that—is in working with the communities in developing this linkage between the Weather Service and the communities that are involved.

Mr. VALENTINE. Thank you very much, Doctor. Your participation in this hearing has been very, very helpful.

Dr. SCHNEIDER. Thank you very much, and I've enjoyed talking with you; and if you have any other further questions, we'll be glad to answer them.

Mr. VALENTINE. Thank you.

I would move to the first panel of media people, and the first person who will present testimony is with WRAL Television in Raleigh, Mr. Greg Fishel.

If we could get all of this panel up here, we'll just go down the line. The others are Mr. Andy Park, of WTVD Television in Durham; Mr. Roy Hardee, WNCT Television in Greenville; Mr. Jack Roper, WITN—that's it, the four gentlemen. If you'd come up, we'll take—Greg, we'll take you first, whenever you're ready to proceed.

As I stated to the other witnesses, the testimony or statement which you present to the committee will become a part of the record—the official record of this proceeding, and you may summarize that or just present it to us in toto—any way that you care to proceed.

We are happy to have you and other members of the panel here.

STATEMENTS OF GREG FISHEL, METEOROLOGIST, WRAL-TV, RALEIGH, NC; ANDY PARK, WTVD-TV, DURHAM, NC; ROY HARDEE, NEWS DIRECTOR, WNCT-TV, GREENVILLE, NC; AND JACK ROPER, WEATHER CASTER, WITN, WASHINGTON, NC

Mr. FISHEL. Just as a general comment, anybody, I think, who gets into the field of meteorology does it because of an interest in extraordinary events, and certainly this year has been an amazing one for the State, to not only have to deal with this event in March but then right on the heels of it, at least by relative standards, a major hurricane 6 months later. So it's been an interesting and an educational year, to say the least.

I've been asked to address five areas here, and I thought I would mention what those areas are and then address each one of them individually.

First, to describe our station's source of weather information before, during, and after the passage of severe weather. First, dealing with prior to the severe weather outbreak of March 28, the WRAL Weather Center was monitoring the weather situation with the aid of various pieces of equipment which we have accumulated over the past 3 years.

In order that all of you may have a clearer understanding of what we can and cannot do, I will describe our equipment.

First, we have a facsimile machine which provides us with a graphical display of raw meteorological data collected by the National Weather Service as well as their numerical models which are of great help in forecasting large-scale weather conditions.

The facsimile recorder also allows us to access satellite pictures, both visible and infrared. The infrared imagery allows a meteorologist to look not only at the cloud pattern but also the temperature of the cloud tops, a technique which is very useful in detecting severe storms.

We also had access to radar information displayed on a television screen from two sites—Raleigh, NC, and Athens, GA.

In addition to all of this, we were hooked into the domestic data circuit via satellite. This circuit distributes hourly weather observations from every major airport in North America as well as upper air data, computer forecasts, et cetera.

And last but not least, the State weather wire, and its most important function to us, we feel, is to link us with the local forecast office at the RDU Airport with respect to warnings issued for our listening and viewing areas.

We use all of this information to prepare our own forecasts, and we currently provide such forecasts for as many as 130 radio stations in three States in addition to our work for WRAL TV.

We also, obviously, keep up with the National Weather Service's forecasts not only for our areas of concern but for other areas as well.

Now, getting to the period of time during the outbreak. During this time, we feel the National Weather Service is best equipped to disseminate severe storm warnings to the public. As a result, we simply act as a liaison between them and the public.

Because of the loss of the State weather wire during the evening hours, phone calls which we have received from the National Weather Service forecast office at RDU were invaluable in getting the warnings out.

Also of great help to us that night was a young man in Laurinburg, whose name is David Beaver. David had been an observer for us for quite some time and learned of the damage near his home. He then traveled to that area and reported back to us on what he had observed. This was our first indication that this event was indeed a major one.

Now, after the severe weather was over, we relied on our domestic data line which relays severe weather reports that are called into the National Weather Service. We also utilized the wire services, some phone calls, although many lines were out due to the storms, and, finally, information from our news crews which had been dispatched to the affected areas.

Now, second, to assess the performance of the National Weather Service during the storms. We feel that considering all the circumstances, the National Weather Service handled themselves as well as they possibly could.

Bob Mueller, MIC, at the RDU office, made sure that he called our office with each and every warning they issued. The loss of the State weather wire that night was a disaster, to say the least, and these phone calls were not only appreciated greatly by our staff but clearly showed a strong commitment by the RDU office to protecting life and property.

There were some limitations due to factors that were beyond their control. The biggest problem, which has already been mentioned, is the 5-centimeter radar that is not a Doppler. This type of radar is subject to attenuation by storms between the radar site and the storms of concern. Also, Doppler radars are the only radars with any consistent success at detecting tornado producing storms.

In addition to this, a shortage of workers and the lack of severe weather spotters proved to be harmful.

No. 3, to provide my perception of the level of cooperation between Weather Service officials, State and local agencies, and the media during severe weather events, particularly during the tornadoes of March 28.

The level of cooperation between the NWS and the media appears to be excellent. Tornado Awareness Week is always handled with the utmost degree of competence. Unfortunately, this year it was a bit late. It was scheduled just post time to the actual event.

I also feel the National Weather Service has demonstrated an infinite degree of patience with the media. Many times their forecasts are butchered by readers on radio and television who choose to make their own interpretation despite the fact that they are not qualified to do so, and many perceived mistakes by the public are nothing more than liberties being taken by people who have no business taking them.

The relationship between the NWS and the WRAL weather center has always been excellent. We have both visited each other's facilities and have a good understanding of our respective roles.

I believe that the Raleigh office has some of the best qualified and dedicated personnel of any Weather Service office I have visited.

No. 4, to discuss—discuss whether storm warnings from sources other than the Weather Service create problems, I wholeheartedly agree with the surveys that indicate the public is confused by numerous and conflicting sources of weather information during a life-threatening situation. This is why we rely on the warnings issued by our local office.

This is not only a courtesy but a realization that the forecast office at RDU can look at the storms in a detailed manner through the use of their radar. They have the capability of looking not only at the aerial coverage and intensities but can view the storm in a three-dimensional manner by varying the height of the radar beam. This is something that most television stations do not have the capability of doing.

It is of interest, however, that the RDU office waited quite a long time before mentioning the potential for severe weather. We first mentioned the possibility of severe weather 36 hours before the observed event during our early morning radio and TV feeds on the 27th. The first mention from the RDU office was contained in the midday State weather summary, which was sent over the State weather wires shortly after 11 a.m., the day of the tornadoes. This occurred despite strong statements from the National Severe Storm Center in Kansas City with respect to the growing danger for the Carolinas.

We felt strongly about informing the public as early as possible about the possibility of severe weather. We also, however, understand that those of us on TV and radio have a better opportunity to qualify our statements and thus can avoid throwing the community into a state of panic. This may have been the reason why the National Weather Service waited as long as they did.

Also, even though the first tornado watch for Alabama and Georgia qualified the situation as particularly dangerous—and that is a quote from the wording of the watch—the subsequent watch for the Carolinas did not make this qualification, and we felt obligated to supplement that information with our own.

In other parts of the country, some TV stations possess radars that are superior to what exists at the local NWS office. In this type of situation, the issue becomes what is of more importance—consistency or commitment to the public?

I know personally of examples where a meteorologist in the Plains States at television stations were able to keep individual communities advised of the progress of severe storms. The time they might have taken to coordinate that information with the NWS could have been the time that saved people's lives.

Perhaps the question here should be, is the NWS properly and adequately equipped in all areas of the country?

The last area I'd like to address is to indicate whether improvements in prediction, communication, or coordination might help reduce destruction in future storms. Some of these things I'm going to address have already been mentioned, so I'm simply echoing or reinforcing that.

Several steps can be taken to try and reduce the loss of life and property that we experienced last March. First, numerical models run at the National Meteorological Center in Washington, DC, are being improved constantly and should be of increasing value in predicting severe weather, at least on a large scale.

The Nexrad program, otherwise known as Doppler, holds great promise with respect to detecting tornadoes before they touch down. If possible, the current schedule of implementation should be accelerated.

The severe weather spotters network as well as a full-time disaster preparedness meteorologist, I agree, would be of great help.

The argument is often made that this was a once in a 100-year event and that a sudden and significant financial commitment is foolish. My answer to that is that tornadoes are not North Carolina's only problem. As we found out last month, our 30-year luck with hurricanes ran out, and flash flooding is always a threat in our mountains.

Also, a backup communication system in case the State weather wire goes out is certainly something that needs to be looked into. If we rely on towers for communication, odds are in favor of this problem recurring at some point in the future.

One thing that has always haunted weather forecasters is the lack of data available. This is most evident in the upper atmosphere where reporting stations are an average of several hundred miles apart and report only twice a day. This makes life difficult when trying to resolve systems whose average path length is 6 miles and average lifetime 15 minutes. However, advances in technology with respect to satellite and radar data may eventually eliminate this problem.

My final concern is related to the general sense of complacency on the part of the public with respect to severe weather watches.

As of this week, the National Severe Storm Center in Kansas City has issued approximately 375 severe weather watches to various parts of the country this year. Even though they have all been justified, it is the nature of a watch to warn a large area. Within this area, only a very small percentage of people are affected by severe weather, and even if they are, many can survive it without any degree of difficulty. As a result, their attitude becomes, "I've heard hundreds of these watches before, and I've never been hurt; I'm going to ignore this one."

Can we be more specific in defining the threat area? The answer, I believe, at this point, is probably not yet. With continued improvements in technology, the future may hold more hope in this area.

It may be of some interest to consider issuing watches with varying degrees of threat: for instance, the watch issued for Alabama and Georgia—the first one on the 28th.

Every meteorologist who worked on the 27th and 28th knew that this was no ordinary system and that it truly had the potential to become a killer. Somehow, we have to convey that high degree of concern with a degree of honesty combined with responsibility.

[The prepared statement of Mr. Fishel follows:]

October 23, 1984

CAPITOL BROADCASTING COMPANY, INC.
711 HILLSBOROUGH STREET
BOX 12800, RALEIGH, N.C. 27605

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We use all of this information to prepare our own forecasts. Currently, we are providing forecasts for as many as 130 radio stations in three states in addition to our work for WRAL-TV. We also keep up with the National Weather Service's forecast, not only for our areas of concern but, for other areas as well.

We feel the National Weather Service is best equipped to disseminate severe storm warnings to the public. As a result, we simply act as a liaison between them and the public. Because of the loss of the state weather wire during the evening hours, telephone calls from the National Weather Service Forecast Office at the Raleigh-Durham airport were invaluable in getting the warnings out.

Also of great help to us the night of March 28, 1984 was a young man from Laurinburg named David Beaver. David has been an observer for us for some time. When he learned of the damage near his home, he traveled to the area and reported back his observations. This was our first indication that this event was indeed a major one.

After the severe weather was over, we relied on our domestic data line for weather reports which had been called in to the National Weather Service. We also utilized the wire services, some telephone calls and information from our news crews which had been dispatched to the affected areas.

We feel, considering all the circumstances, the National Weather Service handled themselves as well as they possibly could. Bob Muller, meteorologist in charge of the Raleigh-Durham office, made sure that he called our office with each and every warning they issued. The loss of the state weather wire during this outbreak was disasterous. Muller's telephone calls were not only greatly appreciated by our staff but clearly showed a strong commitment by the Raleigh-Durham office to protect life and property.

There were some limitations due to factors beyond their control; the biggest problem being that their radar is a 5 centimeter unit and is not a doppler. This type of radar is subject to attenuation by storms between the radar site and the storms of concern. Also, doppler radars are the only radars with any consistent success at detecting tornado producing storms. In addition, a shortage of workers and a lack of a severe weather spotter network proved to be harmful.

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The relationship between the National Weather Service and the WRAL Weather Center has always been excellent. We have both visited each other's facilities and have a good understanding of our respective roles. I believe that the Raleigh office has some of the best qualified and dedicated personnel of any weather service office I have visited.

I wholeheartedly agree with the surveys that indicate the public is confused by numerous sources of weather information during a life-threatening situation. We rely on warnings issued by our local office, not just as a courtesy, but because we realize that the forecast office at Raleigh-Durham can look at the storms in a detailed manner through the use of their radar. They have the capability of looking not only at the aerial coverage and intensities; but they can also view the storm in a three-dimensional manner by varying the height of the radar beam. This is something that most television stations cannot do.

It is of interest, however, that the Raleigh-Durham office waited quite a long time before mentioning the potential for severe weather. We first mentioned the possibility of severe weather during our early morning radio and television feeds 36 hours before the observed event. The first mention from the Raleigh-Durham office was in the early morning state weather summary, sent over the state weather wire, shortly after 5:00 a.m. on the day of the tornadoes.

This occurred despite strong statements from the National Severe Storms Center in Kansas City as to the growing danger for the Carolinas. We feel strongly about informing the public as early as possible regarding the possibility of severe weather.

We understand that those of us on television have a better opportunity to qualify our statements and have thus far avoided throwing the community into a state of panic. This may have been the reason why they waited as long as they did. Even though the first tornado watch for Alabama and Georgia qualified the situation as particularly dangerous, the subsequent watch for the Carolinas did not make this qualification. We felt obligated to supplement that information with our own.

In other parts of the country some television stations possess radars that are superior to what exists at the local National Weather Service office. In this type of situation, the issue becomes what is more important -- consistency or commitment to the public? I know of examples where meteorologists in the plains states were able to keep individual communities advised of the progress of severe storms. The time they take to coordinate information with the National Weather Service could be the time that is required to save people's lives. Perhaps the question here should be -- is the National Weather Service properly equipped?

Several steps can be taken to try and reduce the loss of life and property that we experienced last March. First, numerical models run at the National Meteorological Center in Washington, D.C. are being improved constantly and should be of increasing value in predicting severe weather. The Nexrad program, otherwise known as doppler, holds great promise with respect to detecting tornadoes before they touch down. If possible, the current schedule of implementation should be accelerated. The severe weather spotters networks, as well as a full time disaster preparedness meteorologist, would be of great help here.

The agrument is often made that this was a once in a 100 year event and that sudden and significant financial commitment is foolish. My answer to that is -- tornadoes are not the Carolina's only problem. As we found out last month, our luck with hurricanes ran out and flash flooding is always a threat in our mountains. Also, a backup communications system is imperative in case the state weather wire goes out. If we rely on towers for communication, odds are in favor of this problem occurring again.

One thing that has always haunted weather forecasters is the lack of data available. This is most evident in the upper atmosphere where reporting stations are an average of several hundred miles apart and report only twice a day. This makes life difficult when trying to resolve systems whose average path length is six miles and average lifetime 15 minutes. However, advances in technology with respect to satellite and radar data may eventually eliminate this problem.

My final concern is related to the general sense of complacency on the part of the public with respect to severe weather watches. As of this week, the National Severe Storms Center in Kansas City has issued approximately 375 severe weather watches this year for various parts of the country. Even though they have all been justified, it is the nature of a watch to warn a large area. Within this area, only a very small percentage of people are affected by severe weather and, even if they are, most can survive it without any degree of difficulty. As a result, the attitude becomes, "I've heard hundreds of these watches before and I've never been hurt; I'm going to ignore this one."

Can we be more specific in defining the threat area? The answer is not yet. With continued improvements in technology, the future may hold more hope in this area. It may be of some interest to consider issuing watches with varying degrees of threat. For instance, the watch issued for Alabama and George on March 28th. Every meteorologist who worked on the 27th and 28th knew that this was no ordinary system and that this system truly had the potential to be a killer. Somehow, we have to convey that high degree of concern with honesty and responsibility.

Correction: A correction has been made regarding the timing of the first warning issued by the Raleigh-Durham office. The text has been changed to show the first warning time as 5:00 a.m. not 11:00 a.m. as stated in the hearing.

Mr. VALENTINE. Thank you very much.

Let me just ask you one question quickly before we move on to the other gentlemen on this panel.

I understood you to say that your station broadcast a severe weather warning in advance of the issuance of such a warning by the National Weather Service.

Did you base your warning on information that came to you from other sources, or did your information come from the Weather Service and you just put a different emphasis on it?

Mr. FISHEL. First of all, I want to clarify, we did not issue an official warning. You know, legally, we leave that to the National Weather Service. But we talked at great length as early as the morning of the 27th—the day before the event—that there were many factors that were coming together, at least on a large scale, that had the potential to produce severe thunderstorms as well as tornadoes.

Now, I remember calling a colleague of mine who I used to work with—he is now in Iowa—and talking to him 24 hours before the event and saying, "I haven't heard anything about the potential for this area tomorrow, and I'm concerned about it. Do you think I'm nuts?" and he immediately came back to me and says, "Not at all; I think you're in big trouble."

So, really, what we did was look at the situation with the people that we have in our office, who are educated in the field of meteorology, and made an assessment as to the large-scale threat.

Now, on the day of the event, the Severe Storm Center in Kansas City was emphatic about their concern about the threat of severe weather. In fact, they issued a statement at 2:30 that afternoon, which is in this disaster report, stating that there was a high risk of severe weather and that they termed it a "major severe weather event" and that it was continuing to unfold.

So, really, from that point on, everybody seemed to be in sync on their agreement that it was a major threat.

Mr. VALENTINE. When one is referred to as a meteorologist or a weather expert in the television industry, what does that mean professionally? Does that mean some special training in some academic institution? Does that mean years of experience in television or radio? Just what does it mean?

Mr. FISHEL. There seems to be some differing opinion on that. A meteorologist officially is somebody who has a formal education in the field. By that I mean you go to an institution of learning—the one I went to was Penn State; there are numerous other excellent ones across the country—and you involve yourself in at least a 4-year program which is heavily mathematical and physical in terms of you understanding how the atmosphere works in a dynamic manner.

Now, there are many people who have had quite a bit of experience in the Service—Air Force, Navy—and, simply by associating themselves with people who have a tremendous amount of knowledge in this field, have acquired a good basic framework of knowledge and have called themselves meteorologists at that point.

But I think that it's important that—that people who are trained to make judgments and have the scientific background make them and people that have not trained to make these judgments don't.

Mr. VALENTINE. Thank you very much.

Mr. Park?

If you'd just keep your seat there for a while, we'll come back with questions maybe for the entire panel.

Mr. Park, we're delighted to have you here, sir, representing WTVD in Durham.

Mr. PARK. Thank you, Mr. Chairman.

I would like first of all to, as a matter of sort of personal privilege, to correct the title that is given to me on the listing on the agenda, and it's following with what Mr. Fishel said. It calls me a meteorologist. As Mr. Fishel pointed out, almost anyone can call themselves a meteorologist. The august American Meteorological Society admits to its membership people who have not gone through the formal training that Mr. Fishel indicated.

Because there is no formal licensing board nor any qualification at a governmental level, I choose not to call myself a meteorologist. I'm just a poor old country boy that's spent 25 years studying the weather, and I try to do the best I can, but I wanted to make that distinction clear, that I have no formal degree in meteorology.

In keeping with the report that the very able Dr. Schneider has issued, I'd like to call the committee's attention to what I consider to be the major portion of that report. It's a statement that the Weather Service's main mission is to issue warnings and to ensure the safety of the population.

We believe that you can't save souls in an empty church, and I think that the major thing that we need to address here is not how disaster relief was coordinated, not how people came after the tragedy to respond to it, but whether, in the words of the survey team itself, the main mission of issuing warnings and thereby ensuring the safety of the population was accomplished.

We feel, sir, that that reproduction behind you, which is figure 1 in the survey report itself, attests to the fact that that mission failed. There are 59 graves indicated on it, and any way you look at it, or any way you gloss it over, I think we all, as a part of this team, as others have pointed out—the media, government officials, and the National Weather Service—would—would be ill considered if we approached 59 deaths as anything other than a failure, and it's in that spirit that I am here today to approach this. It's not to find out who did wrong or what did wrong but to acknowledge the fact that 59 people are dead and to together seek some way to prevent this from happening again.

I redraw your attention to the fact that the survey report again emphasizes that the main mission—and these are their words—of the National Weather Service is to issue warnings and thereby ensure the safety of the population.

I would like, Mr. Chairman, your permission to make a portion—make an official portion of the record a statement which I herewith symbolically submit, and it has been turned over to your clerk—of 14 pages, and I will not attempt to read from that. I'd like to summarize a couple of things and, if you have any questions, be responsive to them.

Under finding 9 of that report, it discussed tornado watches and warnings—and I quote from Dr. Schneider's team's report—"There was a paucity of tornado warnings because there were no clear radar indications or spotter reports." I find this the single most disturbing issue to be addressed in this entire survey.

Dr. Schneider, in his verbal testimony, referred at two points to the bulk of warnings that were issued in North Carolina, and if we search his report further, we find that there were actually, I believe, two valid reports issued, one at—it's on page 19 of his report. It says:

> The first 13 warnings issued in North Carolina were for severe thunderstorms. The State's first tornado warning was issued for Wake County at 8:58 p.m., but this turned out to be based on a false tornado report. Tornado warnings were issued at 9:30 p.m. and at 9:43 p.m. for several counties in northeastern North Carolina, some of which had already been hit by tornadoes by time the warnings went out.

So the first valid tornado warning was issued by the Weather Service forecast office at 9:30 p.m., and my reading of the survey report indicates that in our State alone, as best we can retrospectively determine, there were already 17 people dead.

I submit that on the face of it, sir, this would indicate that the warning, which is to call your attention to the fact that a life threatening situation is now upon you, for whatever reason, was too late.

Now, this whole idea of tornado watches and warnings disturbs me greatly. It seems to me that, as a matter of consistency, that the National Weather Service—and they're to be commended for trying to be consistent and not confuse the public, but they have applied the system of watches and warnings to all storms alike.

The watch indicates that the potential is there for that specific pheonomenon. The warning means it's headed your way. Now, you can apply this to a severe thunderstorm, you can apply it to a hurricane, to a flash flood, because the hurricane is there.

When you issue the warning, you can see it, you know it's on the way. A flash flood, if it is raining intensively, you can empirically presume from that that a flash flood potential certainly exists, and you know where it is. Even a severe thunderstorm you can see.

The problem, in order to try and be consistent, and after a great deal of education of the public that we have issued the watch, which means stay alert—but the warning is when we say it's life threatening. That doesn't work in the case of a tornado, because as testimony here has indicated and as the survey report indicates, there simply is not enough lead time, according to the present available technology of the National Weather Service, for that warning to be effective.

I compare it to the old railroad crossing where the crossbars say look out for the cars. That's a watch. When those red lights go on, it's a warning. Again, that can apply, and has applied very successfully, to any number of storms but not to the tornado, because, by the Weather Service's own testimony, they do not issue the warning until one of two things has happened: it has been confirmed on radar, or it has been spotted, many times by untrained spotters, as was the case with the invalid report in Wake County.

I don't know the answer to this problem. Probably a man of character shouldn't raise a problem unless he can propose a solution, but I cannot propose one, Mr. Chairman. I just want to point out that those 59 graves indicate that somebody better figure it out.

I think we owe the republic—we owe the public, all of us, a responsibility to warn them in a better way. If this requires more funding, I respectfully submit that your committee give us all of the assistance—the National Weather Service, that it can, because we are talking about the price of a human life. If it requires more personnel—whatever it requires, sir, I would respectfully request that this committee see to it that it be done, because, again, we have 59 deaths to be concerned about.

Under community liaison, the disaster report indicated—and I quote—"The National Weather Service has the responsibility for issuing tornado warnings."

I'd like to go on record as concurring with that and to note a very disturbing trend—it's been alluded to here—and that is the trend for people other than the National Weather Service to issue a warning or, couched in any other name, to say that this is going to happen.

We at WTVD believe vigorously that the official weather—severe weather warnings should come only from an agency of the U.S. Government.

I happened to be a party in an experiment several years ago where a region of the National Weather Service asked local TV stations to use the NOAA seal and to use a certain format when they issued watches and warnings so that the public could determine that these were coming from the National Weather Service, not from Bozo the Clown who happens to be your local weatherman, or from some consultancy, or something like that.

The National Weather Service is under great attack at the moment by private consultants and quasi-public consultants who want the right to issue warnings on their own. We want to go vigorously go on record and say that that should be restricted to the National Weather Service, an official agency of the U.S. Government.

I would be, I think, remiss if I didn't say that I think the National Weather Service has not been vigorous enough in defending their right to do that, but whatever reason, we ask the committee's help in reinforcing that.

This is not in any way to say that we as public broadcasters are advocating any further Federal regulation on broadcasters. We hold with Mr. Justice Holmes that freedom of speech is still a primary constitutional right, but it doesn't give you the right to shout "fire" in a crowded theater, and we think most vigorously that those watches and warnings should be issued only by the National Weather Service.

In keeping with that, however, back to the main mission of the Weather Service. Their primary mission is to issue warnings, and we submit that that failed miserably, certainly in our case and in the case of many broadcasters, on the night of March 28.

The allusion has been made that the NOAA weather radio is one of the primary methods of warning. It certainly is if you have a receiver which will receive that frequency, which is in the 162 megahertz frequency. Many people—most people do not have that kind of radio.

That is also alluded to as a backup of informing the media so that we can hear it. That's all well and good, but the reports seem to overlook the fact that where our studios are located have nothing to do with the area that our television signal covers.

My station's primary studio is in Durham; Mr. Fishel's is in Raleigh, the primary studio. The NOAA weather radio transmitters are spotted throughout the 22-county area that we serve, and just by way of an example, one that might be located in Kinston, NC, we cannot physically receive in our studio.

So when the weather wire, the 1920's type teletype, broke down, its only backup was the NOAA weather radio, and we could not receive it in the area that was under attack, which was the far southeastern part of our television coverage area.

So what we really want to point out is that the system of warning to the media to reinforce the main mission of the National Weather Service failed to a great degree, in our opinion.

Dr. Schneider's report also indicates that the primary method the National Weather Service has of informing the public is through the radio and television media of an event that is about to occur.

On that particular night, with the failure of the NOAA weather wire and the subsequent inability of the NOAA weather radio to be received at some areas, they then resorted to making telephone calls, and according to what we have read in the report, they called one station, which they refer to as a key media outlet.

I would like permission, Mr. Chairman, to have that point addressed by our president and general manager, Mr. Paul Bures. He has a very brief statement. With your permission, I would like to read that in the record. If you prefer——

Mr. VALENTINE. We'd be delighted. Please proceed.

Mr. PARK. Mr. Bures submits,

> For 30 years, Television Station WTVD has served a significant portion of the heart of Carolina, and in 1984 it continues to do so. On the night of March 28, 1984, through direct access to warnings issued by the National Severe Storms Forecast Center in Kansas City, Missouri, WTVD was able to provide timely and speedy warnings to its viewers of what turned out to be tragic severe weather conditions. To discover after the fact that the local office of the National Weather Service was restricting its warnings to one television outlet is a source of serious concern to us. As attachment A shows

and it is attached to his statement—

> more than half of the TV households in the area affected by the tornado outbreak do not listen to or view only one television station. WTVD is licensed to operate in the public interest. We always have, we always will, with or without equal consideration on the part of the National Weather Service.

That's over the signature of Paul Bures, Jr., the president of WTVD.

Again, I come to—not to assess blame or to point out what was wrong, only in how we can succeed in preventing something like this happening again. We have several suggestions.

We would suggest that the National Weather Service or its parent agency consider appropriate advisory committees which are made up of members of the media, both in general at a national level and particularly at a local level.

It's understandable that people in the meteorology profession don't necessarily have the expertise to know how radio and television works. This is one thing that a warning/preparedness meteorologist or a liaison is supposed to do, to make contact to find out how they work.

It's evident from Dr. Schneider's report that they had no idea that the NOAA weather radios throughout the area could not be received physically in the studios of the radio and TV stations, which in their own report they submit are their main channel of disseminating information.

We would also suggest that the Raleigh Weather Service Forecast Office is desperately in need of someone to be in contact with all of the media. Dr. Schneider's report continually refers to key media outlets, and the action of the Raleigh Weather Service Office on the night in question indicates that they contacted only one outlet, and we would submit that that evidence stands on its own that they are not aware of the fact that the American public doesn't just listen to or follow one media outlet.

It's not a question here, Mr. Chairman—I think it's too serious a matter for it to be a question of competition or any pique on our part, and we're not alone, because, according to their report, no other broadcast station was given the same phone calls every 10 or 15 minutes.

Mr. VALENTINE. By broadcaster, do you mean not only television but also radio?

Mr. PARK. That is correct, sir. According to that report, and I'll stand corrected if the report is in error.

But what we are saying here, it's not a matter of competition; we compete vigorously, we do not compete when lives are threatened. We communicate with each other; we communicate with other stations when we can attempt to save lives.

We think the National Weather Service has an obligation, a legal responsibility actually, to disseminate information as its main mission to all of the public, according to their terms, through the broadcast media, and we are part of that.

We would suggest also that they need to investigate the rapidly changing state of the art in broadcast. The capability of pushing a button and having a visual map on the home television screen that shows you the area in question is certainly available today. It's antiquated to say that the watch area is on a line 50 miles either side of Columbia, SC and Lizard Lick, NC; that went out years ago. You can push that button, and on your home screen you can see where the area under threat is.

Those sorts of things, we think, are there, and that they need to be made aware of it in the National Weather Service, and this can be done by better interfacing and intercommunication.

Also, there's a great deal available in the broadcast industry that can be of service to the National Weather Service. Certainly we throw money around, and they don't; they guard it.

I would point out to you that the first Doppler radar, as Mr. Fishel indicated, it is the next thing online or to be online for the National Weather Service under the NEXRAD Program. The first one that was ever put onstream was put on stream by a Minnesota television station, not by an agency of the U.S. Government. So sometimes, for whatever reasons, there is equipment available in the various media that can be of service to the National Weather Service if they are aware that it's there.

Even in my own station, we have some equipment that we think might be of some benefit. In the 2½ years that I have been resident in this position, no member of the Raleigh Weather Service Forecast Office has ever visited our facility. So I know of no way that they would know that anything is there.

Let me say in closing, sir, that we believe that dedicated men and women in the public and the private sectors are laboring under tremendous stress with absolutely the best of intentions to protect the American public, but as so often happens, Mr. Chairman, in politics as well as in government and private service, the difficulty of getting things done frequently wars with the actual fact of them being done.

A congressional committee—subcommittee such as yours, Mr. Chairman, is the last bastion of a people in action, and it is the people that we all attempt to serve.

We would implore this committee to provide the motivation, to cut the redtape, to produce the legislation, and, yes, sir, even to provide the funding, to find the money necessary to make a cohesive whole out of what I think behind you, Mr. Chairman—59 graves—is self-evident that we have a fragmentation of parts that on March 28, 1984, that is mute testimony that that system failed.

We do not point that out with any blame, sir. We point it out as we think it should be pointed out, as a mutual tragedy for all of us who should be involved in—to quote Dr. Schneider's report—"ensuring the safety of the populace."

Thank you, sir.

[The prepared statement of Mr. Park follows:]

Written Statement on behalf of Television Station WTVD, Raleigh-Durham-Fayetteville, before the Congressional Subcommittee on Natural Resources, Agriculture Research and Environment; Rocky Mount, NC, Oct. 18, 1984.

Mr Chairman, Honorable Members:

My name is Andy Park. I am in charge of the Weather Department of television station WTVD, for 30 years, a cornerstone of television broadcasting in the 22-county area of the Heart of Carolina. WTVD is an affilaite of the CBS television network and serves a populace from the south-central counties of Virginia to the Southern Border of North Carolina and from the Triad area of North Carolina to the coastal environs.

Our weather department is staffed by two professional weathercasters, and is augmented and supported by a fully staffed news department and full professional production facilities second to none in the mid-North Carolina area. On our staff is a graduate meteorologist and a holder of the American Meteorological Society Seal of Approval for television weathercasting.

WTVD maintains a fully functional weather operation capable of accessing the state-of-the-art technological data available from the National Weather Service as well as private weather forecasting firms. All forecasting at WTVD is done internally and we stand behind our weather operation in every way.

Additionally, WTVD is the only station in North Carolina and one of the few in the nation to operate and maintain remote-sensing, Class "A"-type weather gathering stations at seven locations throughout its broadcasting area. These remote operations provide accurate and professionally calibrated weather data to WTVD from areas either abandoned by governmental operations or covered only by amateur weather observers.

In addition to the 22-county area covered by WTVD via aerial transmission signal, the station was received in other localities within the state via cable (particularly along the North Carolina Coast in the Wilmington area.)

WTVD appears before this honorable committee today in response to a survey report issued in July, 1984 on behalf of the administrator of the National Oceanic and Atmospheric Administration, the parent agency of the National Weather Service. That report, hereinafter referred to as the Disaster Survey, concerned Carolina Tornados on March 28, 1984 and was chaired under the very able Dr Eric D. Schneider, Special Assistant to the Administrator of NOAA.

The purpose of this submission by WTVD is to add to, clarify and take issue with some findings of that report.

The overall reason behind the appearance of WTVD before this committee is best illustrated by Figure 1 of the report wherein each cross represents the loss-of-life of one of our fellow citizens, our neighbors, a fellow North Carolinian and a fellow human being.

Our deep concern is, we hope, motivated only by this deeply tragic loss and our feeling at WTVD of sadness, frustration and even emphathetic anger that, perhaps, this loss could have been reduced, if not precluded entirely, by a better functioning team of government, private and media cooperation.

Our purpose is not to assess blame (the crosses on that appendix speak eloquently to a mutually shared measure of that!) but rather to seek in concert with other members of this "team" to minimize the possibility of any repeat of a natural disaster tragedy of this magnitude.

Accordingly, our submission, will fall into the following categories:

1. How the "team system" operated;
2. Where improvement is suggested; and,
3. An appeal for progress.

1. HOW THE SYSTEM OPERATED

Approaching the Disaster Survey Team report in sequential order:

In the prologue the report states: "Members of the team visited the Carolinas...between April 2 and April 6, 1984. The team interviewed ...media representatives...etc."

For the record, no member of the team nor any staff member contacted WTVD, nor was any notice given to WTVD that such a survey was under way. As mentioned previously, WTVD is a primary informational medium to the area in question with transmitter located in Auburn, NC and quality grade signal delivered to 22 counties plus cable supplemation.

1.1 Under EXECUTIVE SUMMARY, the report states: "The NOAA Weather Wire Service is the major link between the broadcast media and other key users in the warning chain, ultimately including the public at large."

WTVD concurs with the accuracy of this statement and deplores the fact that it is accurate.

In many areas of the country, Weather Service Forecast Offices (WSFO's) have recognized that the antiquated "teletype" of the 20's is no longer a viable method of dissemination of urgent emergency information and have supplanted it in a number of ways:

- Many WSFO's utilize a "hot line" that rings in all media and other user offices when activated at the WSFO. After all parties are on the conference line, the WSFO verbally delivers the warning information for simultaneous dissemination via all media. The costs of this system are borne cooperatively by the media; the WSFO designates an NWS duty individual to perform this task and, most important, delegates to him the authority to do so without the delay of seeking Meteorlogist-in-Charge approval. The assumption is that the duty individual is professional enough to accept the responsibility or he wouldn't be employed at the WSFO. The fact that no "printed" copy remains to justify a posteriori quarrels is not considered important enough to delay life-saving information.

- Many WSFO's utilize the Emergency Broadcast System (EBS) in place throughout the country to alert broadcast media to the existance of a warning. Media then contact the WSFO via unlisted phone line. (It is interesting to note that contact phone numbers for the Raleigh WSFO were not disseminated nor were contact phone numbers for the media solicited until after the publication of the Disaster Survey Report. At most WSFO locations throughout the nation, the WSFO and Media representatives have each others unlisted numbers, home numbers and other contact numbers that even wives are not privy to - in short, there is a mutually recognizable professional respect and unorthodox method, if necessary, in place to notify the media and, thus, serve the public.)

1.2 Under Finding 1, the report states:

"While Raleigh's Weather Service Forecast Office has established excellent and close working relationships with State Emergency Management officials and key media outlets in its immediate area, the same needed links to...TV and radio stations in the areas affected ...were found wanting."

The phrases "key media outlets" and "its immediate area" point up, we believe, the serious deficiency at the Raleigh WSFO in the absence of a designated contact with the media...a designee who may or may not be labeled a warning/preparedness meteorologist. Such an individual would have understood that the phrase "key media outlet" is discriminatory and presumptious at best, and seriously ignorant of broadcast technique at worst. Such an individual would have advised the survey team that the phrase "TV and radio stations in the areas affected" errs in basis. The applicable observation would be where the TV and radio station's signals are transmitted, not where they are located. We submit that the fact that seat of government is in Washington does not limit its influence to that immediate area...

Further, while there is great validity in the observation that no such person has ever been designated, we submit that the frustration at bureaucratic and budgetary delays in creating or filling critical positions should not pre-empt the official in charge from recognizing that the critical need must be met by extraordinary means in times of life-threatening disaster, even to fulfilling that vacuum himself.

1.3 The report states further:

"...the Weather Service's main mission of issuing warnings and ensuring the safety of the populace."

We concur and observe to an even stronger degree that information delayed is information denied.

The resort to NWWS "teletype" for information dissemination is not only antiquated, but unnecessary. The ability to "build a file" or the time and date when warnings were sent for later case-building no longer holds water when auditors are made to realize that the times indicated on such teletypes in no way necessarily represent the "real-time" when they were transmitted or received. (See below in comment on Page 24 of the report - Warnings and Lead Times by County.)

While statements and warnings are being "compiled" and entered into computers preparatory to being run; while audio tapes are being written, practiced, recorded and placed into cycle for the NOAA Weather Radio system; while local higher authority is being sought even to release such statements and warnings, people may be dying. This is particularly true in the case of tornados.

We do not mean to be critical of individuals or even of individual performance...we do, however, wish to identify ourselves with Dr Schneider's team's observation that the "Weather Service's main mission" is to issue warnings and ensure the safety of the populace.

No amount of brilliant meteorology; no amount of research; no amount of improvement of technology; in essence, nothing, in our estimation can supplant the main mission of ensuring the safety of the populace.

The old adage says: "You can't save souls in an empty church!" and, by extension, unless the main mission of the NWS and it's WSFO's is to disseminate information, than all the knowledge in the world cannot prevent more loss of life.

It is interesting that, even at the highest level, the official terminology of the NWS refers to others than staffers as "external users" of NWS data and not its "audience", its constituants, or even its "main mission!" We submit that the public, and the media through whom they are informed, are badly termed "users" rather than the main mission for which the tax-funded NWS exists.

1.4 Under Finding 2, the report states:

"...the survey team could find no evidence of organized severe storm reporting networks..."

We concur...and further point out that the North Carolina State Department of Agriculture, the state emergency management office, the state flood hazard office, many radio and television stations, most newspapers and even a number of amateur radio and weather organizations already contain more than the nucleus for such networks.

In the case of WTVD, in the two-and-a-half year tenure of this writer, no member of the Raleigh WSFO has ever even visited our weather office and, to our knowledge, none has any idea of our capability to assist their main mission. By extension, it can be assumed until proven otherwise, that there may very well be capabilities in the public and private sectors that could be of great service to the Raleigh WSFO and the NWS in a mutual mission.

1.5 Under Finding 4, the report states:

"Since NOAA Weather Wire is the key link to the news media and hence to the general public..."

We deplore, as mentioned above, that the antiquated state-of-the-art from the Raleigh WSFO (or whereever the responsibility lies) makes this a true statement but we applaud the reinforcement of the axiom that the news media is "hence to the general public". We would commend this to the attention of the priorities of those involved.

1.6 The report further states:

"The staff of Raleigh repeatedly phoned critical information to meteorologists at a key TV station that also operated an 82-station radio network throughout the state."

We would hope that the seriousness of the tragedy that occured on March 28th would make all set aside the mundane considerations of private competition, but we are pragmatic enough to realize that any observation from one of those competitors might be considered subjective at best, and self-serving at worst. We will not attempt, therefore, to comment on the reasons why the staff at the Raleigh WSFO decided to pick and choose whose listeners and viewers would be warned. We will leave the analysis of that to objective investigators and stand behind their observations.

We concur hearily in Recommendation 4, and further encourage those sources to be utilized instantaneously and not with unnecessary delay. Again, information delayed is information denied.

1.7 Under finding 6, the report states:

"NOAA Weather Radio is an excellent warning and information source."

We concur and would only add that it is only as effective as the importance placed upon it by the WSFO inputting information. We would suggest to the investigators that it might be revealing to explore the actual time delay before such broadcasts are disseminated in relation to the actual time the warning is available within the WSFO. We would suggest that an excellent source of this information might be the WSFO personnel themselves, although, for understandable reasons, such information might best be obtained in executive session.

1.8 Under Findings 7 and 8, the report commends the National Severe Storms Office in Kansas City and the Kansas City Satellite Field Service Station, among others, for their outstanding work.

We concur most heartily. We would further observe, in keeping with the above referenced "main mission" of the NWS, that information is only as good as the speed with which it is relayed to the public. Again, if there is any validity in our concern about the delays in disseminating information to the media and "hence the general public" it is magnified in this case and works counter to the excellence of those National Forecasting Offices.

(As a side observation, the Deputy Meteorologist-in-charge at the Raleigh WSFO is one of the top five experts on tropical cyclones and hurricanes in the world. Joe Pellissier makes his own expertise available at all times when such an occurance threatens the North Carolina coast. He informs, guides when asked, and, most important, answers when information is sought. On whose authority we don't know, but Mr Pellissier also initiates guidance and assistance to the media when he feels it would be helpful. We point this out to underscore how vital such a service would be to the media in the case of tornados, the single most violent storms on earth and those that strike with the least warning. Contrast the delays in disseminating tornado information. Admittedly, such an expert in the tornado field cannot be expected to be at each WSFO, but the attitude toward the NWS "main mission" need not be confined to experts, in our opinion.)

1.10 Under Finding 9, the report discussed tornado watches and warnings. At one point, the report states:

"...there was a paucity of tornado warnings because there were no clear radar indications or spotter reports..."

We find this point the single most disturbing problem in the whole matter of tornado warning technique.

As a matter, perhaps of consistency, the "system" of watches and warnings has been made to apply equally to winter storms, blizzards, hurricances, severe thunderstorms and tornados.

We submit that this consistent system fails in the case of the tornado.

The decision point to jump from "watch" to "warning" is the point at which the phenomenon is present and probably threatening the area to be warned. With winter storms, floods, certainly hurricanes, etc., the phenomena is of such duration that "lead time" can be utilized to adequately warn the populace.

A Hurricane is THERE, a storm is on radar and trackable, a flood can be presumed by intense rainfall. Such is NOT the case with a tornado. By the time it is observed on radar (other than Doeppler), by the time it is reported by an observer (usually not a trained observer), the "lead time" for dissemination under the best of situations can be woefully inadequate. Under the situation now understood as of March 28th, 1984, there simply was no lead time.

We would not presume to offer a solution to this virtually self-evident problem. Better minds than ours should be addressed to it. We would, however, submit that consistency is an inadequate explanation for sticking with a system that has continually failed.

We are aware of the real and imagined chagrin on the part of warners to the "cry wolf" syndrome. With all compassion, we would say, explain that to the families of the crosses referred to on Figure 1.

An adequate warning method, system and technique must be found, and disseminated vigorously.

1.10 Under METEOROLOGICAL ANALYSIS, the report gives a thorough and detailed scientific analysis of the progress of the storm.

Not as a point of criticism but rather, as a point to ponder, we point out the phrase in paragraph 6, last line, that states: "The lifetime of the tornado-producing supercell was unusually long, nine hours" and ask that this sentence be placed alongside one in paragraph 4, page 19, which reads: "Six tornado warnings were issued, but many not sufficiently early to provide useful advance warning."

1.11 Under COMMUNITY LIAISON, WARNING SYSTEMS AND THE MEDIA, the report states:

"While the National Weather Service has the responsibility for issuing tornado warnings..."

We note a disturbing trend in the weather information community that, we submit, is confusing or has the serious potential to confuse the public about severe weather watches and warnings. We feel that the NWS has not moved vigorously enough to establish its sole authority to issue warnings. In that vein, this Congressional Committee could assist to providing whatever authority is necessary both to solidify the NWS authority and to ban private issuance of "official" watches and warnings.

Several years ago, this writer was part of an experiment in which the NWS asked television stations to use the NOAA "seal" and a standard format whenever such statements were issued. As a follow-up, a survey was made of the observations of the stations. We are not privy to the findings of that follow-up survey but, regardless, we go on record emphatically of asserting it is the responsibility, the sole responsibility, of the NWS to issue such official statements and, as federally regulated broadcast stations (as well as intensely public-spirited broadcasters) we welcome expeditious attention to this problem.

Understand, we are not endorsing the idea of increased federal regulation of the airwaves. On the contrary, we hold that the journalism of the broadcaster should share the same protection given that of the print media under the First Amendment to the U.S. Constitution.

But, as Mr Justice Holmes, observed: "Freedom of Speech does not give one the right to shout 'Fire!' in a crowded theatre."

Whatever the positions of public, private, commercial, and quasi-public "consultants", weather "services" or privately employed meteorologists, the right and responsibility to issue official warnings, we believe, rests, and must rest, with the official weather agency of the U.S. Government. In that event, our airwaves, as well we are sure of every other broadcaster in this nation, are at the immediate service of the NWS.

But, Mr Chairman, we submit that right and responsibility not exercised, is a right and responsibility erroded or abandoned.

We would respectfully ask this committee to offer whatever help needed to remove all confusion from this issue of official warnings.

Again, we find no conflict with the First Amendment in this narrow matter. Neither the Sacred Document itself, judicial interpretation, judicial "legislation", statutory nor common law, to our knowledge, prohibits such a determination.

1.12 In paragraph 3 of this section, the report states:

"With the exception of NOAA Weather Radio broadcasts, which come directly from the National Weather Service, the tornado warnings are received by the public from television and radio."

We concur, and heartily suggest reiteration in view of the above stated "main mission" of the NWS.

1.13 We find an inconsistency in Paragraph 5 of this same section where the report details the duties of a Warning/Preparedness Meteorlogist; outlining that he should spend about three-quarters of his time in preparedness-related activities "and with emergency service organizations and the broadcast media". The paragraph concludes: "Where there is no dedicated weather/preparedness meteorlogist position, the Weather Service Forecast Office designates a forecaster to act as the program leader for that activity, if and when time permits."

If, as the report states, and we support, the "main mission" of the NWS is to ensure the safety of the populace, and, the primary method of doing that is to disseminate watches and warnings through NOAA Radio and "TV and radio stations" the phrase "if and when time permits" seems to us to war with the mission.

To the case at point, we have pointed out that not until after the issuance of this report were supplementary phone numbers to the Raleigh WSFO made available; we have pointed out that, in the two and one-half year tenure of this writer, no member of the Raleigh WSFO has ever visited or inquired of our facilities, and, we have pointed out the WSFO unilateraly determined to pick a "key TV station" to inform on the night of March 28th, we submit that the "main mission" has not been performed.

Further, we certainly do not minimize the importance of liaison with rescue, relief, and emergency teams in the event of a disaster; we do suggest that the order of sensible priorities would dictate that "warning" to prevent or minimize loss of life and property would take precedence over activities to respond after the disaster strikes, particularly in the case of an agency of government whose "main mission" is to warn while other governmental agencies have as their mission to respond, rescue and relieve.

Again, we encourage any motivation that would result in the Raleigh WSFO receiving funding for a warning/preparedness meteorologist or, should that fail, result in that office finding time to permit those vital duties to be performed with the staff on hand. The importance of that seems to us illustrated by the crosses on Figure 1.

1.14 Under THE WARNINGS - NORTH CAROLINA, page 19, the report states:

"The first 13 warnings issued in North Carolina were for severe thunderstorms. The state's first tornado warning was issued for Wake County at 8:58 p.m. but this turned out to be based on a false tornado report. Tornado warnings were issued at 9:30 p.m. and 9:43 p.m. for several counties in northeastern North Carolina some of which had already been hit by tornados, by the time the warnings went out."

We grieve at the accuracy of this statement.

1.15 On Page 20, the report states:

"NOAA Weather Radio worked throughout the storm and was a main channel - and sometimes the only channel - of dissemination during the storm."

We would only point out in regard to this that the structure of the NOAA Weather Radio system makes it of little use in a situation where major broadcast stations transmit a signal that covers the area of several or many NOAA Weather Radio signals. At the studio of the Radio or TV station, they can only hear the NOAA signal that covers their area. In the situation here discussed, the tornado activity was in the far southeastern portion of the Radio and TV station coverage area. NOAA Weather Radio in that area was of no use to Radio and TV Meteorologists located in studios in Durham and Raleigh.

1.16 Under MEDIA - NORTH CAROLINA, the report states:

"When the Weather Wire was knocked out, the Raleigh Weather Service Field Office kept the "Weather Center" at WRAL-TV in Raleigh informed of all severe storm issuances at 10 to 15 minute intervals until the Weather Wire was restored."

No such service was offered by the Raleigh WSFO to WTVD or, to this writer's knowledge, to any other area broadcaster, in spite of the "main mission" of the NWS to "ensure the safety of the populace". We would be hard put to inform our listeners that the Raleigh WSFO placed their lives in jeopardy as a penalty for not watching the "key" TV station were it not for the fact that our public FCC files are full of letters from viewers who would testify to the contrary.

We are proud of our service to our viewers even though we did not know at the time that it was being performed in spite of, and not with, the help of the Raleigh WSFO.

1.17 The report reads further:

"The WRAL "Weather Center" is staffed by two professional meteorologists, who have the capability and authority to interrupt programs during tornado and thunderstorm warnings, a method they find much more effective than the cumbersome, time-consuming preparation of a crawl."

We welcome any study of the comparative "professional" capability of our staff in contrast to that of anyone. Since we have never seen a member of the Raleigh WSFO in our facilities we cannot, of course, quarrel with the source of their basis for decision.

We regret that WRAL finds the crawl method "cumbersome" and "time-consuming" since our operation allows us to place such notices directly on the air, presumably while they are still running up one flight of stairs for a live interrupt.

We have full authority to interrupt, and do, our programming at any time for weather advisories and we are proud that WTVD stayed on the air all-night and at times when WRAL was dark transmitting not only a picture of WSFO Radar but relaying NOAA Weather Radio to those viewers who do not have the particular receivers necessary to monitor those broadcasts.

We will welcome any comparison of the "actual times" official NWS advisories were transmitted on our air compared to any other commercial broadcast station in North Carolina. Until such comparison is made and verified we would submit that it ill behooves any objective National Disaster Survey Report to state a fact not in evidence.

1.18 The report reads further:

"The splendid cooperation between the Weather Service Field Office in Raleigh and the WRAL "Weather Center" is significant because of the wide WRAL audience, 365,000 viewers between 6:00 p.m. and 7:30 p.m. and 245,000 during the remainder of the prime time hours. The WRAL meteorologists broadcast tornado safety advice during the 6:00 p.m. news broadcast. In addition, they provide meteorological broadcasts over the affiliated North Carolina News Network, which serves 82 radio stations throughout the state. According to the operations director of the radio network, 27 of the stations - mostly full-time stations with large listening audiences - broadcast to the areas where the tornados occurred. He also estimated that about 40 percent of all radio stations in the network use NOAA Weather Radio and its tone-alert capabilities to alert themselves to severe weather. Weather forecasts are broadcast over the network nine times daily and severe weather is also handled during the newscasts."

The report gives no source for most of this information; we presume it is stated on the authority of those signatory to that report.

We have diligently searched the title page listing of those on the survey team and fail to find one whose expertise rests on comparative market analysis in broadcasting.

This writer has requested that comment on this portion of the report be over the signature of Paul Bures, Jr., President and General Manager of WTVD and a Vice-President of Capital Communications Corp., and, Mr Chairman, I respectfully request permission for the following inserted submission by Mr Bures:

> For 30 years, television station WTVD has served a significant portion of the population of the Heart of Carolina and, in 1984, it continues to do so.
>
> On the night of March 28, 1984, through direct access to warnings issued by the National Severe Storms Forecast Center in Kansas City, Mo., WTVD was able to provide timely and speedy warnings to its viewers of what turned out to be tragic, severe weather conditions.
>
> To discover, after the fact, that the local office of the National Weather Service was restricting its warnings to one television outlet, is a source of serious concern to us.

As Attachment "A" shows, more than half the TV households in the area affected by the tornado outbreak, do not listen to or view only one television station.

WTVD is licensed to operate "in the public interest". We always have and we always will, with or without such equal consideration.

Respectfully submitted,

Paul Bures J.

Paul Bures Jr.
President
WTVD

1.19 WARNINGS AND LEAD TIMES BY COUNTY - Page 24

This table purports to show the actual "lead times" between the issuance of warnings by the WSO's and WSFO.

Our comment concerns the technical method of timing the issuance of these advisories.

It has been the experience of WTVD, a subscriber to the NWWS, that the time printed on the issuance frequently bears no relationship to the actual time the advisory is either transmitted or completed and thus, in usable form.

It is our understanding that the time, placed at the "top" of the advisory, is placed on the computer tape at the time that tape is prepared. Only after the tape has been moved to the transmitting teletype and a computer interrupt triggered, does the advisory start to move across the weather wire. (As a point of interest, all weather wire teletypes type simultaneously so the one in the WTVD office is printing in concert with all the others.)

Additionally, an advisory is not in usable form most of the time for broadcast until the transmission is finished.

For years, major news wires have used a method of timing the actual completion of transmission by entering at the bottom of the item the time transmission is completed. In recent years, that function has been performed automatically by an inboard clock within the computer that types in the actual time the transmission finishes.

This seemly trivial fact assumes importance when a study is made by such a group as the Disaster Survey Team because they must rely on the times indicated on copies of the teletype transmission as the "actual time" a warning or advisory was made public. This is misleading.

No malfeasance is implied, but the fact that times indicated are not accurate becomes important when trying to assess what actual warning was made available to public dissemination in a life-threatening situation.

It has been our experience that, in some cases, the times indicated on transmissions and the actual time of transmission can vary by hours, not just minutes.

2. WHERE IMPROVEMENT IS SUGGESTED:

We would suggest that the appropriate advisory-issuing officials make it a point to study and understand the interfacing of modern broadcasting methods and techniques. Attached as Appendix "A" is a signal coverage map of WTVD. If this map is superimposed over the regional forecast zones of the Raleigh WSFO and, additionally, over the broadcast coverage areas of the various NOAA Weather Radio signals, the problem becomes understandable. As we have stated above, where a TV station has its sutdios located has no bearing on its ability to transmit information to a given area.

We would suggest that the Raleigh WSFO and the NWS in general consider an advisory council composed of knowledgeable members of the broadcast industry from not only the meteorological fields but from engineering and news to improve the mutual transmission of information between NWS and the conduits of its "main mission".

We would suggest that the NWS investigate the rapidly changing state-of-the-art in visual broadcasting via commercial TV. Most TV stations today have graphics capability and can interface with a computer modem to both the AFOS system of NWS and other graphic generation equipment. In a day when the push of a button can provide a visual map of a watch area, say, it is antiquated to issue only a watch perimeter in terms of "50 miles either side of a line from Columbia to Lizard Lick N.C." This approach bears as much relationship to modern television reality as the legal description of a piece of property does to a homeowners back yard.

The same state-of-the-art capabilities can allow NWS and Commercial TV stations to receive the benefits of each others equipment. Developing today is the ALDS system wherein lightning strikes are reproduced graphically on the home TV screen. And we would point out that the first operating Doeppler Radar in the nation was put on-stream by a Minnesota TV station, not the NWS.

We see no threat to the healthy competition that is the life-blood of modern day television commercial broadcasting. All weather information, whether acted upon by private consultant, in-house meteorologist or the lead forecaster at a local WSO comes from the same source, i.e. the unsurpassed date-gathering capability of the finest weather service in the world, the NWS. Competition comes in HOW the material is presented, not in where it comes from. In matters of life-threatening severe weather, no responsible commercial broadcaster would hesitate for a nanosecond to share his information with all competitors.

3. AN APPEAL FOR PROGRESS:

A careful study of this submission, as well as the Disaster Survey Report itself will lead any objective observer to one conclusion:

Dedicated men and women in both the public and private sectors are laboring under tremendous stress with absolutely the best of intentions to serve the American Public.

As so aften happens, in politics, Mr Chairman, as well as in government or the private sector, the difficulty of getting things done wars with the need for things to be done.

A congressional committee is the last bastion of a people in action...and it is the people we all serve and to whom we owe protection.

We would implore this committee to provide the motivation, to cut the red tape, to produce the legislation and, yes, to find the funding necessary to mold a cohesive whole out of a fragmented albeit well-intentioned sum of parts of a weather warning team that failed on March 28, 1984.

Fifty-nine graves attest to that failure.

There is enough blame for all.

Let us begin.

Respectfully submitted,

Andy Park
WTVD
Durham-Raleigh-Fayetteville

Attachment "A"

1984 vs 1983 COUNTY COVERAGE - RALEIGH-DURHAM ADI
PERCENT SHARE OF COUNTY VIEWING
EARLY NEWS

COUNTY	TOTAL HOUSEHOLDS	TV HOUSEHOLDS	1984 WTVD	1983 WTVD	1982 WTVD	1984 WRAL	1983 WRAL	1982 WRAL
CHATHAM	13,000	12,800	14	15	18	33	43	31
CUMBERLAND	81,300	80,250	26	26	26	30	32	36
DURHAM	59,850	59,050	56	58	70	24	23	20
FRANKLIN	10.700	10,500	28	27	30	59	62	56
GRANVILLE	11,000	10,800	36	36	47	56	55	47
HALIFAX	19,050	18,600	22	18	22	36	50	43
HARNETT	21,700	21,400	25	26	23	57	54	70
HOKE	6,600	6,450	30	18	28	35	38	41
JOHNSTON	26,550	26,150	19	18	15	60	67	81
LEE	13,700	13,500	20	19	24	59	39	52
MOORE	20,850	20,450	11	18	19	45	34	41
NASH	25,250	24,850	19	16	17	49	57	62
ORANGE	30,450	29,900	43	39	44	32	29	28
PERSON	10,500	10,350	35	42	28	32	33	51
SAMPSON	17,850	17,550	13	13	19	49	52	50
SCOTLAND	11,150	10,950	23	29	18	30	15	21
VANCE	13,000	12,800	39	21	26	50	56	68
WAKE	119,950	118,650	17	21	18	60	56	71
WARREN	5,500	5,400	36	32	23	58	62	77
WAYNE	34,950	34,450	23	26	20	39	32	40
WILSON	23,100	22,700	23	20	25	45	41	49
MECKLENBURG (Va.)	10,400	10,200	14	18	9	42	30	31

1984 vs 1983 COUNTY COVERAGE - RALEIGH-DURHAM ADI

PERCENT SHARE OF COUNTY VIEWING

LATE NEWS

COUNTY	TOTAL HOUSEHOLDS	TV HOUSEHOLDS	1984 WTVD	1983 WTVD	1982 WTVD	1984 WRAL	1983 WRAL	1982 WRAL
CHATHAM	12,750	12,550	16	17	23	27	33	24
CUMBERLAND	80,450	79,300	25	30	28	32	28	34
DURHAM	59,050	58,200	48	54	57	25	22	25
FRANKLIN	10,500	10,250	32	20	26	44	70	63
GRANVILLE	10,900	10,700	39	29	42	20	40	53
HALIFAX	19,050	18,550	28	20	21	36	48	31
HARNETT	21,350	21,000	28	34	37	36	45	54
HOKE	6,500	6,300	9	37	26	31	40	57
JOHNSTON	26,350	25,900	29	18	26	48	57	60
LEE	13,650	13,450	20	25	21	47	28	52
MOORE	20,250	19,850	11	16	18	46	26	39
NASH	24,900	24,450	17	22	23	44	48	50
ORANGE	29,800	29,200	32	26	34	32	25	34
PERSON	10,450	10,250	65	44	37	15	33	31
SAMPSON	17,600	17,250	15	17	33	40	42	43
SCOTLAND	11,050	10,850	38	31	30	12	22	29
VANCE	12,950	12,750	30	17	27	36	49	60
WAKE	116,400	115,000	20	17	24	50	49	59
WARREN	5,450	5,300	37	38	27	40	36	66
WAYNE	34,500	33,950	25	26	24	34	27	41
WILSON	22,750	22,350	27	20	18	44	40	55
MECKLENBURG (Va.)	10,450	10,200	23	18	20	15	21	23

1984 COUNTY COVERAGE

RALEIGH-DURHAM ADI

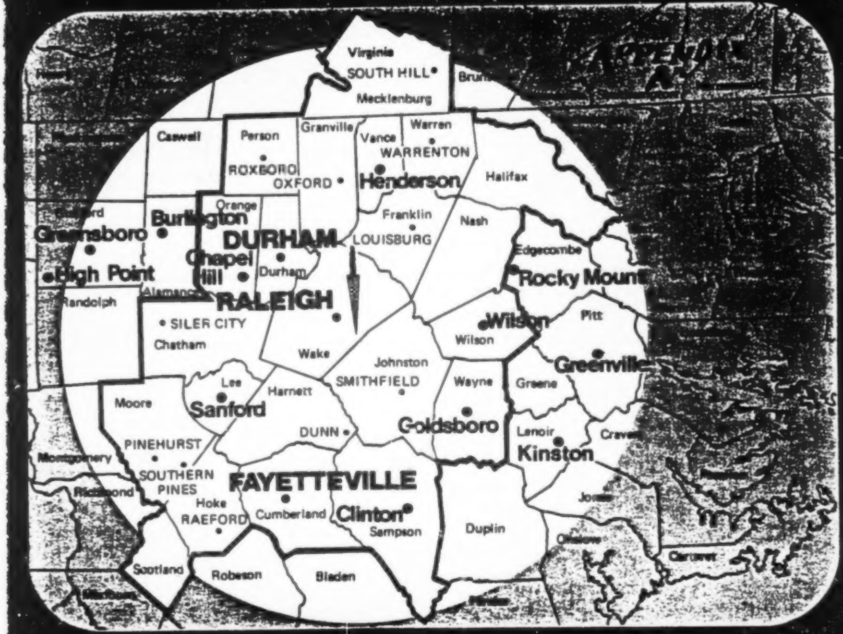
PERCENT SHARE OF COVERAGE VIEWING

COUNTY	TOTAL HOUSEHOLDS	TV HOUSEHOLDS	WTVD	WRAL	WPTF	WLFL	WKFT
CHATHAM	13,000	12,800	15	25	11	6	-
CUMBERLAND	81,300	80,250	23	25	2	1	8
DURHAM	59,850	59,050	36	27	13	6	-
FRANKLIN	10,700	10,500	30	42	10	9	-
GRANVILLE	11,000	10,800	36	40	9	7	-
HALIFAX	19,050	18,600	20	24	-	-	-
HARNETT	21,700	21,400	32	39	8	9	2
HOKE	6,600	6,450	20	28	1	2	7
JOHNSTON	26,550	26,150	27	39	7	8	-
LEE	13,700	13,500	24	32	12	6	1
MOORE	20,850	20,450	15	29	5	3	2
NASH	25,250	24,850	21	27	2	1	-
ORANGE	30,450	29,900	26	27	14	6	-
PERSON	10,500	10,350	23	29	8	6	-
SAMPSON	17,850	17,550	20	33	3	2	2
SCOTLAND	11,150	10,950	14	15	2	-	4
VANCE	13,000	12,800	28	38	11	8	-
WAKE	119,950	118,650	26	38	14	7	-
WARREN	5,500	5,400	34	50	1	-	-
WAYNE	34,950	34,450	23	24	3	2	-
WILSON	23,100	22,700	26	28	2	1	-
MECKLENBURG (Va.)	10,400	10,200	27	23	1	-	-

SOURCE: 1984 Abitron Ratings: County Coverage. This report is based on data obtained during Arbitron's May 1983, July 1983, Nov. 1983 & Feb. 1984 surveys.

11 together WTVD

Raleigh•Durham•Fayetteville


Virginia
SOUTH HILL
Mecklenburg
Caswell
Person
Granville
Vance
Warren
WARRENTON
ROXBORO
OXFORD
Henderson
Halifax
Orange
Burlington
Greensboro
High Point
DURHAM
Chapel Hill
Durham
Alamance
Franklin
LOUISBURG
Nash
Edgecombe
Rocky Mount
Randolph
RALEIGH
SILER CITY
Chatham
Wake
Wilson
Wilson
Pitt
Greenville
Johnston
SMITHFIELD
Lee
Harnett
Moore
Sanford
Wayne
Greene
Goldsboro
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SOUTHERN PINES
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Kinston
Craven
FAYETTEVILLE
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Cumberland
Clinton
Sampson
Duplin
Jones
Onslow
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Scotland
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Mr. **Valentine**. Thank you, Mr. Park.

We'll come back later with some questions if time permits.

I would like to request the cooperation of the panel. We would like to go—to complete the testimony of this panel and also hear from Dr. Friday before we adjourn for lunch at—at 1 o'clock.

Mr. Hardee?

Mr. **Hardee**. Mr. Chairman, thank you for the opportunity. My remarks will be brief. I have no prepared statement, but few events have had the impact, at least in North Carolina, as did the storm of March 28.

There are hundreds and thousands of broadcasters across the Nation that will not have, and do not have, the sophisticated equipment as some of our larger stations do across the way. So for years to come, I would anticipate that the National Weather Service will in fact be the primary source of information for weather warnings and such for many broadcasters.

Thusly, the National Weather Service should be given top priority in making sure they have the latest in technology and in liaison staff and personnel. I feel that they have been the victims of budget cuts in an area which, as some of the previous speakers have said, we are dealing with lives and budget cuts, as far as making the job a harder task for them to do.

Certainly Doppler radar, which has been pointed to as the most sophisticated form of detection for tornadoes, virtually does not exist in many of the national weather stations. This, it seems to even an amateur, should have been a top priority item.

We cannot place blame on the people of the National Weather Service if the public and the Members of Congress did not see fit to provide them with the tools that they should have.

Let me say that the level of cooperation that we at WNCT-TV have had with the National Weather Service has been excellent. We have visited the facilities at RDU, and they have visited our facilities. They have provided us with on-air information, and every time we have made a request to them about any type of weather situation, we have always got a response.

We have been provided with proper numbers to call, not only the regular media numbers but emergency type numbers, so that we have instant communications with them, and this has proven most invaluable, and particularly with the most recent hurricane visit by Diana.

We did lab reports from the National Weather Service, and we had virtually constant communication with them. But without the proper equipment—I can't emphasize that too much—and without the proper staffing, these people cannot be expected to perform at the level that we all hopefully will be able to.

On March 28—and I think it's been pointed out—tornado watch No. 56 was issued at 2:14. I believe it moved on our weather wire at about 2:45, and we began airing with a tornado watch for the people of eastern North Carolina at approximately 2:50.

That information was aired on a regular basis about every 20 to 30 minutes until 9:02 at night, at which time we got knocked off the air because of the storm ourselves. This is also approximately the time when the storms were hitting through most of the area between 9 o'clock and 9:30, somewhere in the area that we find basically the tornadoes hit.

But from shortly before 3 o'clock until 9 o'clock, we had information on about the potential for the storm situation. We also had updates on our 6 o'clock news about the storms hitting into Bennettsville and these type of things. Information at that time was very sketchy, but at least you saw that there was a potential.

So, frankly, I can say this, that the people in eastern North Carolina and in the area that were hit by the storms of 1984, when you have a weather system now—a weather bulletin, these people are scared.

We get constant telephone calls about, should I move out of my mobile home? should I do this? I mean they have been through something that's probably—only can be described as equal to a war zone, and we have to have, however, official warnings and official information. We don't want to go on the air and cry wolf.

So the information that we get from the National Weather Service is what we go by, and as soon as we get the information we go on with it live, if it's a warning, right then. We interrupt whatever program we have to provide that information and to update as constantly as possible.

But again, I can only say that we need to give the people in the National Weather Service the equipment and the personnel and the funding to do the job which they are charged with the responsibility of.

Let me say one thing also. As far as our station was concerned, the weather radio system worked. We—we receive warnings on the weather radio system, and we have those in our news room and located at several places, but I can only say again, give these people the tools to work with, and I think you'll find they'll do a superb job.

Thank you.

Mr. VALENTINE. Thank you, Mr. Hardee.

You mentioned something here that's been on—that has been on the minds of a lot of us, I'm sure. I believe that's the first time it was mentioned here. That is the "cry wolf" syndrome.

We heard the first witness—all of us did—Mr. Horne, who said that he had lived in Robeson County—Mr. Chairman, it's spelled like Robeson, but it's Robeson—that county for a long time, or all of his life, and had heard warnings, notices, or pronouncements, or forecasts of bad storms, tornadoes, and other type of disturbances, but had never seen one. How much of a problem is that really in the minds of you—you gentlemen, and, if so, how do we address it?

I wonder how many people know the difference between these degrees or classifications of warnings that come from the media and how many have seen the little strip running across when they're watching their favorite prime time television show that says something about—that brings to their attention some disturbance, and it happens so many times, and nothing happens—nothing occurs. Now, that's nobody's fault, but that's a problem, isn't it?

Mr. HARDEE. Yes, sir, and I think, Mr. Chairman, that all the stations basically have gone well beyond the range of just carrying the crawls and the information, but the people have gone on the air and said, "Now, this is exactly what a watch means. This is what a warning means. This is what you should do if—if the weather situation threatens."

I think that more and more emphasis by all the broadcasters sitting here and across the State are to not just give you the fact that we have a tornado watch but this is what you should do—get in the closet; get in the bathtub; these are the signs you should watch out for.

Mr. VALENTINE. Mr. Roper of WITN, Washington, we are delighted to have you here, too, as part of this panel. We will hear from you at this time, sir.

Mr. ROPER. Thank you, sir.

You have our prepared letter statement, but we would like really just to kind of go over some notes that we've prepared aside from that.

From the outset, let me mention the fact that there is complete cooperation with the National Weather Service in Raleigh, as well as Wilmington, as well as Cape Hatteras. When it comes to communications we have with them, it has always been that case.

A lot of what I have has already been said.

Since, in eastern North Carolina, with our station, we do have four sources of weather, the local live radar and in addition to that the wire service, which we lost that evening, and the radio backup, the NOAA radio, plus the NBC satellite feeds—we lost our main line of communications with the National Weather Service that night for approximately 2 hours, with the microwave tower toppling in southeastern North Carolina.

Might I make a few suggestions for backups? Again, we've discussed the—the radio system, the NOAA radio, which is—is all well and good and serves certainly a purpose. There needs to be more education toward the public in its availability, but I think perhaps Mr. Hardee more than some—and Andy mentioned something as well.

Our receiving of the signal is not always very clear. We've had some problems with that. It is indeed a good backup system, but bad reception seems to be a problem.

TV-7 at one point, from my speaking with management, did offer our tower as a site for their transmitter. I think that was probably before we erected a 2,000-foot tower, but we did offer that. It was not taken up and done anything with, but we think maybe, perhaps more repeaters or more powerful transmitters should be available to make the signals clear. This is a problem we do run into, at least where we receive the signal in Washington.

Another backup system we think that would possibly be worth checking into is something that Kansas City, I believe, has or did have—hopefully they still have it—is a direct audio loop to TV stations.

Of course, you are familiar with the EBS system with radio stations that sound the signal, and of course it goes on radio. I think perhaps in TV we think we've become maybe a little too sophisticated. I think possibly a direct audio loop to TV stations, a separate phone line, and what-have-you into our master control would be a—a viable backup to receive direct—direct transmissions or bulletins from the Raleigh Weather Service Office.

A question I have--and that's exactly what it is—discovering an AP machine in our newsroom and a backup to the AP machine. I'm wondering why that night perhaps—I know it was a busy evening for everyone concerned, but why perhaps AP and UPI could not have been used more efficiently as somewhat of a backup. I do know we receive some weather information. It's usually late compared to the Weather Service, but possibly it could have been used and in a much better fashion.

And whether the effort was ever made to call the six eastern North Carolina TV stations that night as far as the people in Raleigh at the Weather Service, I'm not sure we were ever tried to be contacted, and I'm not sure the effort was made. I know—I'm learning that—I believe one of the stations in the Raleigh-Durham area was contacted as a so-called flagship station.

I think more phone lines—I am running into problems now—tornado season of getting through with a media number to the Raleigh station—Raleigh was. I think maybe more media lines should be installed as well as emergency management lines, which they do have separate numbers at this point.

In addition, I think maybe the relationship between the media, specifically TV, and with spotters, could be a bit closer. As far as WITN-TV is concerned, we are on a list of contacts for spotters as well as emergency management people. We are to be contacted by both of those in the case of sightings and emergency positions with weather, whatever they may be.

Another thing, there is a separate link audio line between the—the officials—the Government officials—pardon me—the local law enforcement officials as well as emergency management people. We've mentioned it today—NAWAS. I'm wondering if perhaps the media could indeed be connected into that system as it is not at this particular time.

Another point we'd like to bring out—and it has been covered very thoroughly, I think—is equipment and personnel improvement. I can't, first of all, imagine any job being open with the Federal Government and not being filled.

Since in no case was there any—since in no case there was any lead time before tornado warnings were issued—and I stand corrected, but I'm looking at your report, the NOAA report, that is—since in no case there were lead times provided before tornado warnings were issued in relation to actual tornadoes touching down, there is indeed a definite need for a new radar system.

Raleigh needs at least the 10-centimeter unattenuated radar system at a minimum. We've talked to Doppler. I think that—that ultimately would be the way to go. We have a local radar set up for eastern North Carolina.

Our signal—our TV signal goes into 40 counties at this point, but Raleigh does have—the Weather Service—a 5-centimeter attenuated local radar, and that evening—that night, they had definite problems in—in identifying super cells and the hook or the signature of severe weather and thuswise were late in making the weather bulletins known to us. Then of course they didn't have the wire service anyway for 2 hours.

But I think that night we would have also been in terrible, terrible shape even if we'd had the wire service, looking at some things I have here.

The Raleigh Weather Service has personnel vacancies. They've had them from, I think, 1 to 5 years or in that general area. I don't understand why they have—they have not been filled, unless of course the funding is—is not there. A prime example is the fact of the warning preparedness meteorologist.

By the way, the South Carolina gentleman—the gentleman in South Carolina that has that job, he is also responsible for North Carolina. Being a sandlapper, South Carolina sure is a whole lot smaller than North Carolina, but that is part of his job, I think, immediately, and perhaps that is being done at this point. I think that job should be filled. That way——

Mr. VALENTINE. Are you saying he was a sandlapper or you are?

Mr. ROPER. I am, and I guess he is, too; I don't know.

Mr. VALENTINE. I haven't heard that expression in a long time.

Mr. ROPER. Sandlapper.

Mr. VALENTINE. I've spent——

Mr. SCHEUER. Mr. Chairman?

Mr. ROPER. We've found another one back there.

Mr. SCHEUER. Could I ask a question there?

Mr. VALENTINE. Yes.

Mr. ROPER. Yes, sir.

Mr. SCHEUER. If those slots in the Weather Service that have been unfilled for several years had been filled, as Congress intended that they be, would that have reduced the damage or perhaps the loss of life? If that additional personnel had been on hand to help cope with the incredible emergency of March 28, would——

Mr. ROPER. Well——

Mr. SCHEUER. Would that have helped reduce the damage and loss of life?

Mr. ROPER. I think so, for one reason, the gentlemen in the Raleigh-Durham area, I think, have a—a better—I hate to use the word "rapport," but they are closer to the Weather Service in Raleigh, and they can see each other first hand, we being some 90 to 100 miles from Raleigh.

Again, our—the cooperation is fabulous between our station and the Raleigh Weather Service, but with the preparedness warning meteorologist—and that job is not filled at this point, from what I know—his job would be indeed to go to the outlying areas and set up education systems, recruit spotters, to train spotters. His job would be primarily for the outlying areas, and in this case Raleigh being pretty much central to the State, at least in government, and as the Weather Service office is concerned, it would behoove—it would behoove us to have that job filled.

To answer your question, yes, I think it would have made a lot of difference.

Another point. After filling the jobs and checking the radar, and hopefully buying some new equipment, education. We have—all of a sudden now, we have enormous attention of the public.

As Mr. Valentine mentioned, running a crawl over your favorite soap opera just doesn't get it. They take so long to get on the air, and you would be amazed at the phone calls and reaction from those housewives that don't like, at 3 o'clock or so when we first issued our warning, of seeing that interrupt a marvelous scene on their soap opera.

We used that system because we thought it was the quickest way at one point to get on. We also used the live, you know, drop-ins on camera with our local radar showing the storm cells moving through the area.

But the point I'm trying to make is, while we have people's attention, it is up to us, the media—the TV medium in particular—to educate.

One good point I think was made was the fact that weather radios, no matter how good or bad, depending upon of course the—the air and the transmission at that time—no matter how good or—good or bad the radio—NOAA radios are, they are available, they are inexpensive, and public service work should be done with the TV and radio stations to inform people of their accessibility and their inexpensiveness.

We aired a 30-minute special after the tornadoes, a little late, but we aired it, and we coupled that with education for the upcoming hurricane season, which has been rather interesting to this point.

I think more education should be—should be a part of our TV programming as far as the media. That's one thing we can do immediately if we haven't already done at this particular point.

The term "crying wolf" came out, and, you know, that's—that's pretty tough. I don't like the term, but I think maybe the key word really is "overwarning." You know, we—we see hurricanes, as Mr. Park mentioned, offshore, and we know they are there, and they do exist, but at that point hurricane warnings may not be issued, but we know the beast is alive and well and kicking, and we think he may indeed come ashore.

But overwarning, I think, possibly should almost be a way of life with tornado activity as it is with hurricanes if indeed the personnel of the Weather Service offices have a question as to whether to issue a tornado watch or a tornado warning, and again maybe we should rename tornado warnings. Maybe they should be called tornado red alert.

Mr. SCHEUER. How about "soap opera specials"?

Mr. ROPER. "Soap opera special" would be a definite possibility.

Mr. VALENTINE. Did I understand you to say—did I understand you to say a while ago that you—you have in your experience actually had a—a person or persons call in and complain because you——

Mr. ROPER. Oh, sure.

Mr. VALENTINE [continuing]. Interrupted——

Mr. ROPER. I'm sure——

Mr. VALENTINE [continuing]. This soap opera to tell them that there was a storm coming that might kill them?

Mr. ROPER. Well, that's true. That's——

Mr. VALENTINE. I could understand that if you interrupted the pro football game on——[Laughter.]

Mr. ROPER. Those ladies love the soaps.

Mr. VALENTINE. A feeble attempt at humor.

Mr. **Park**. Mr. Chairman, if I could just interrupt for just a moment, the night that we are talking about, while those storms were still killing people, and when we were reporting deaths, because of our vast coverage area and because all of the activity was in the southeast, my switchboard was overloaded with calls from people the storms had passed saying, in words which I wouldn't even use before a congressional committee—so you have an idea of how—how vigorous they are—yes, sir—complaining about the fact that we were interrupting their program, and it's very—I would very definitely endorse that, but that is a fact we live with, sir.

Mr. **Hardee**. Let me say also, Mr. Valentine, that's absolutely the situation we've had, even to the point, not during this particular outbreak but some of them that followed shortly thereafter, to the fact that we even received a—a bomb threat, which we think probably was because somebody was really just upset about the weather crawls they expect us to vacate.

Mr. **Valentine**. Well, thank you, gentlemen, very much.

[The prepared statement of Mr. Roper follows:]

WITN-TV, Inc. 7 WITN-TV P. O. Box 468 Washington, North Carolina 27889 Telephone (919) 946-3131

October 17, 1984

U.S. House of Representatives
Committee on Science and Technology
Suite 2321 Rayburn House Office Building
Washington, D.C. 20515

Gentlemen

WITN-TV's sources of weather information includes the N.O.A.A. wire service, weather radio, live local radar and NBC's satellite feed.

On the night of March 28, 1984, our main weather information source the N.O.A.A. wire service stopped functioning for approximately two hours. I do feel that if enough staff was on hand at the Raleigh weather service office, the six TV stations in Eastern North Carolina should have been contacted to be given information on the weather. One must remember, however, that personal contact may have been impossible since some phone lines were down. The Raleigh weather office did call on a later day to see how long we were without our wire service on the night of March 28th.

The performance of the Raleigh weather office seems to have been hampered by radar problems such as verification of tornado producing super cells, and issuing weather bulletins early enough to provide lead time before any or most tornado damage occurred. New radar equipment seems to be in order, plus filling staff positions that are open especially the Warning/Preparedness Meteorologist who would work to create public awareness campaigns, set up educational programs, recruit and train spotters.

As for cooperation, the North Carolina weather service people are very knowledgeable and more than happy to work with WITN-TV. This also is the case with emergency management people.

In addition to radar equipment being updated, filling staff positions, the Raleigh weather service needs to devise several back up communication plans incase the N.O.A.A. wire service and N.O.A.A. radio broadcasts ever fail. One such back up would be a close line of communication between spotters and the TV medium.

Consideration should also be given to a direct audio hook up to TV stations from the Raleigh weather service office to air bulletins promptly.

Lastly, since the disaster of March 28, 1984 has gotten everyone's attention like never before, TV stations should now especially use air time to educate the public on safety tips, purchasing of weather radios, and etc.

Cordially

Jack Roper

Jack Roper
Weather caster
WITN-TV, Inc

Mr. VALENTINE. If I understand what—what you are saying to—to this panel, it is that you get along OK with the—with the Weather Service and that there—there's a need for some—some backup procedures. That perhaps somebody should have made a determination that if you're going to use towers to get information to warn people of oncoming tornadoes, that you better darn sure be sure you've got another one somewhere in case the one that you utilize is in the path of the storm. And that perhaps there is a—maybe some room for improvement in communications between you professionals who have your charts and who really are in touch with the people who—who look at television, some reason for some or better organized effort for you to have communication in the form of seminars and so on with the Federal Government.

But whichever way we slice it, don't we come back to the fact that one of the main problems, if not the main problem, is that the Congress of the United States had appropriated funds and had directed that there be a certain number of personnel on duty at the Raleigh-Durham Airport and that those jobs were not filled and the people were not there to do the job? Don't we come back to that?

Mr. ROPER. Yes, sir.

Mr. PARK. If I may, Mr. Valentine, I would—I would agree with Jack, but I would also hold that the latest list I have, which is 2 years old, shows some 30 personnel on board.

I would hold that if their main mission is to disseminate information—and, as the report says, if they don't have a warning preparedness meteorologist, they should do it when and if time permits. I would think it's also a question of priority.

The fact that the vacancy existed that night certainly had a factor—was a factor.

Mr. VALENTINE. Yes.

Mr. PARK. But it's also, I think, self-evident, sir, that someone didn't fill the vacuum, and when you're going over the hill in the front line and—and one of your infantrymen gets shot down, you don't stop shooting, and my complaint that evening is that the No. 1 priority of the National Weather Service is to issue warnings, to disseminate that information, and that because there was a vacancy there, it's to be deplored, but the vacuum was not filled.

Mr. VALENTINE. Thank you very much. Doctor—thank you very much, gentlemen. Doctor——

Mr. FISHEL. Could I make one other comment real quickly?

Mr. VALENTINE. Yes.

Mr. FISHEL. I wanted to say in defense of the National Weather Service that even though one death is—is more than what obviously is desirable in a situation like this, the original forecast put out by the Severe Storm Center at 2:30 that afternoon raised the possibility of this mesolow, which is a very small-scale low pressure area, that was in direct relation to the tornado outbreak, would go on a track from Athens, GA, to Raleigh-Durham by 0 z, which is 8 o'clock, p.m., eastern time.

Now, had that mesolow gone along that path, it would have patched—passed over a much, much more highly populated area, and you may have had a real disaster on your hands in terms of the death toll being up in the hundreds somewhere.

So it is indeed fortunate that the track of this, even though it was a tragedy, in many cases was over an unpopulated area, and I think the fact that they kept it down—if you'll pardon the honesty—to 59 may be to their credit rather than their failure.

Mr. VALENTINE. Excuse me. Would you repeat that last sentence? I was talking with my chairman.

Mr. FISHEL. I—I think the fact that 59 people died is a tragedy, but I think that maybe they could be credited with keeping it down to 59 as opposed to playing it up that it was, you know, inexcusable that that many people died.

Mr. SCHEUER. How many less could it have been if that—that spot had been filled and the early warning system that Congress had devised and expected to be put into effect had been operational?

Mr. FISHEL. That I don't know, because there are—and I hate—I hate to sound like I'm passing the buck here, but there are problems with people not listening to information.

I mean even during the hurricane, we had several people, when it was still a tropical storm, that were calling us saying, "Give me the latest on the hurricane," and my first response to each and every one of those calls was, "It's not a hurricane," and where that information is coming from, whether or not it is being erroneously disposed by some television or radio station, whether or not it's the old problem with whisper down the lane—that if I tell you something and you tell him something, and then by the time it gets to the end there's no similarity—I don't know, but one thing we have tried to do is that we have an audio tone now before we run a crawl, because the problem is that somebody may be out in the kitchen making dinner or something like that.

All of a sudden, they look at the TV; they see the tail end of a car go by; they run in there; they see only what they want to see or hear what they want—only what they want to hear and then that message gets passed along in an erroneous manner. So I don't know how you solve that kind of a thing, but there has to be some sort of work done on people listening and reading what's being put in front of them accurately and dealing with it in that manner only.

Mr. PARK. Mr. Scheuer, if I might address that——

Mr. SCHEUER. Yes.

Mr. PARK [continuing]. Very briefly, I think that's our responsibility. The National Weather Service's responsibility is to get that information to us. It's up to us, the professional broadcasters, to make people listen, and I think that's what we try to do and that's what we will do with warnings and watches. The fact that people hear the cry "wolf" is because they are hearing the same baying of the same hound all the time and I think all of us conscientiously try to, within the parameters of that warning, to say—not to be overblunt, but to say we think—put our professional expertise on top of it. We think this is a hell of a warning as opposed to a warning warning.

That failure—in other words, getting the public's attention—I think you have to lay directly at the feet of us. That's something we have to solve. Make them listen and make them believe.

Mr. Valentine. Thank you very much, gentlemen. Let's—if you stick around, let's see what Dr. Friday has to tell us, maybe, about this—at least the personnel problem. Doctor, if you're ready. Just the facts.

Dr. Friday, we're delighted to have you here with us. You have filed your statement and it will be a part of the record of this proceeding and read it or summarize it or proceed in any way that you see fit. We're glad to have you here, sir.

STATEMENT OF ELBERT W. FRIDAY, JR., DEPUTY ASSISTANT ADMINISTRATOR FOR WEATHER SERVICES, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ACCOMPANIED BY ROBERT E. MULLER, METEOROLOGIST IN CHARGE, RALEIGH WEATHER SERVICE FORECAST OFFICE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Mr. Friday. Thank you very much, Mr. Chairman.

I am glad to be here today, unhappy in one respect that it has to be after the scene of a disaster of the size and shape that we had in the Carolinas; happy to be here to be able to interact at the local level, at the community level, at the State level because I think that's one of the most important things we can do in the National Weather Service.

The National Weather Service is a large organization by some standards; it's a small organization by others. We have approximately 5,000 people scattered across the country from Point Barrow, AK, to San Juan, PR; from Wake Island in the Pacific over to Caribou, ME. Obviously, that includes the area of the Carolinas. I have accompanying with me here today Mr. Bob Muller, who is our area manager from North Carolina, who is the meteorologist in charge at the Raleigh-Durham office and, in case there are in any detailed questions about what happened that night, what happened during that timeframe, I will turn those over to Bob because he lived through that; I didn't. I was sitting away watching that go on from the—from the distant aspects of Washington, DC.

I would like to take this opportunity to review briefly the findings and recommendations of the survey team that Dr. Schneider headed and to tell you what we in the National Weather Service, both at the national level and at the local level, are doing in response to those recommendations.

Finding number one, that vacancies and lack of warning preparedness meteorologists prevented WSFO Raleigh-Durham from performing community liaison warning coordination and hazard awareness and recommending that we bring Raleigh up to full staffing and add a warning preparedness meteorologist.

Also, that we examine across the entire United States not just simply in North Carolina; not just simply in Raleigh-Durham area, but examine across the United States the entire warning preparedness dissemination system, how we get the information so vital to that essential mission of the National Weather Service for the protection of life and property; how we get that information across to the public in a responsive manner so that the public reacts to that.

The positions at present time at Columbia and Raleigh, both Columbia, SC, and Raleigh-Durham, NC, offices have been—the positions have been filled. The meteorologist positions have been filled and the warning preparedness meteorologist is currently under recruitment for the office here at Raleigh-Durham. We will be adding that position here; one that was never here before, but obviously, with the size of the State we have and the frequency of events and the increasing population along the coast, it is becoming more and more important that we do that and we will be adding a position here at Raleigh-Durham to do that

Finding number two basically addressed the issue of no organized storm reporting networks.

Mr. SCHEUER. Excuse me, may I ask just—in connection with this unfilled slot which you have now decided to fill—one might say closing the stable door after the horse has fled—looking at it nationally, what is the authorized ceiling for the National Weather Service and what is the actual staffing nationwide? In other words, how many unfilled slots do you have nationally that Congress gave you and expected you to fill which you haven't filled?

Mr. FRIDAY. The warning preparedness meteorologists across the Nation—there are 16 warning preparedness meteorologist slots across the Nation that we have—as dedicated individuals at the Weather Service Forecast offices in the severe-weather-prone sections of the country, at present time, we have 12 of those filled, 4 are currently vacant.

Mr. SCHEUER. Is there anything wrong with those slots, anything wrong with the salary levels, the job description which they should be difficult to fill?

Mr. FRIDAY. No, sir. There's——

Mr. SCHEUER. Why haven't you filled them?

Mr. FRIDAY. In——

Mr. SCHEUER. Haven't you learned a lesson from March 28, 1984?

Mr. FRIDAY. In the—most of those slots have been associated in positions across the southern portion of the United States and through classical Tornado Alley, that particular section of the country.

We have, over the last several years, have been introducing newer improved technology in many sections of the country; we have been adding the AFOS equipment which serves now as the work station for our forecasters and the Forecast Office to integrate all of the weather data, to compose their forecast messages and to issue those forecasts across the country. In many cases, that has reduced the workload in the field so that we have been able to hold certain slots vacant, not really requiring that they be full and still being able to satisfy the full mission of the individual or the service office.

It is easy to address the point that we should have filled these slots in this particular case, even though—well, first of all, let me clarify the record. A special dedicated warning preparedness meteorologist slot has never existed in North Carolina. It was not one of the States that a slot was positioned for.

Mr. SCHEUER. I thought that was the slot that was vacant.

Mr. FRIDAY. No, there was a meteorologist slot that was vacant at the time. The staff was down one. I think you also had an

ELTEC down and you had a meteorologist technician off on maternity leave at the time. Those were the two slots that we were down.

Mr. VALENTINE. What's an ELTEC?

Mr. FRIDAY. Electronic technician, maintenance—basically a maintenance person.

Mr. SCHEUER. I thought these warning meteorologists were slots where meteorologist worked so that—performed the job of networking.

Mr. FRIDAY. That's correct. That's exactly——

Mr. SCHEUER. That can't be taken over by technology. That's a job of working with people.

Mr. FRIDAY. No, sir. What I—what I'm saying is——

Mr. SCHEUER. And the basic failure that you have here in this community on March 28, as I've gotten it, was partially a failure of technology—the signatures didn't work and the communications tower which was meant for an emergency collapsed in the emergency, which seems utterly bizarre to me that they weren't designed to handle the very emergencies for which they were created in the first place, but a major part of the problem, as you yourself have described it, is that people hadn't been trained to listen; they hadn't been trained to pay attention, and that is precisely the job of these warning meteorologists around the country, those four slots.

I don't see that that can be taken over by technology. That's a job of outreach——

Mr. FRIDAY. No, sir——

Mr. SCHEUER [continuing]. And jawboning, isn't it?

Mr. FRIDAY. That's exactly the case and——

Mr. SCHEUER. Well, why haven't they been filled?

Mr. FRIDAY. What I meant to say as a result of these four slots that we have, dedicated disaster preparedness or warning preparedness meteorologists that have not been filled, in the cases where they have not been filled, as the workloads slackened on the other members of the staff, more and more of the MIC's time or the deputy MIC's time, meteorologist in charge's time, could be devoted to these outreach programs.

Bob Muller spends a great deal of time working with the public. It is not his sole job, but he does spend a great deal of time working with the public as do all of our meteorologists in charge. So as the—as the technology has allowed the production work of the Weather Service Office to improve, that releases more and more of the senior staff time for availability in the disaster preparedness area.

One thing—go ahead, sir.

Mr. SCHEUER. I respect what you're saying. You obviously know what you're talking about and have great credibility, but I have a sneaking suspicion in the back of my mind that in an administration where they wanted to save bucks and where there was a tornado warning system set up with safeguards for the public designed to save life and injury and vast property damage for the occasional tornado that comes down once every—well, great number of years—that somebody in Washington felt, well, we can take a chance on this and not fill that spot.

They were just shooting craps with the health and safety of the American people. Now, I'm not putting those words into your mouth; I'm just speculating a little bit, but it has the odor of that to me, that because these emergencies only come once in a great period of time and you could look—you could look at the very slot of the—of the warning meteorologists performing outreach and networking in the community as sort of an insurance policy. Somebody is saying, well, we're going to skip a few annual premiums on that policy and we'll take a chance with the life and the health and the well-being of the American public because we're determined to cut into all of these unnecessary programs and if we can get on with that for a few years, well, then, it was unnecessary.

I know that's not your point of view and I know that you're a dedicated professional, but I have a sneaking suspicion that somebody up a few levels just wanted to save some money and they didn't want to do it by cutting out the B-1 bomber or the MX missile or "Star Wars" and they figured, well, we'll do it on the tornado warning system. Probably won't need it in 1984. Statistically, the chances are very small that we'll need it in 1984. That would be a correct assumption, wouldn't it?

Mr. FRIDAY. It certainly would be.

Mr. SCHEUER. But the gods had it differently. The gods were warning us. They were sending us this signal, that you don't tamper with the health and safety of the American people. If you set up an early warning system designed to protect the public health, by God, it—there was a reason for it and you don't shoot craps and you don't take chances and you don't try and save a few bucks where life and health and safety is involved.

Do you think that is a reasonable feeling for a Congressman to have?

Mr. FRIDAY. I can understand why you might have the feeling, sir.

Mr. SCHEUER. Yeah. I have a great feeling of frustration, not with you, at all. I've enjoyed your testimony and we're fortunate to have men of your caliber in the Weather Service. But I just have a sneaking suspicion that somebody up—up a few levels was willing to take chances and to gamble with the health and the well-being and the safety of the American people when they had absolutely no reason to do that.

And the gods on Mount Olympus just sent them a signal last March 28 not to mess around with Congress' safety programs designed to protect the life and well-being of the American people.

Don't you think the gods on Mount Olympus were trying to send that to them? [Laughter.]

Mr. VALENTINE. You know, Mr. Chairman, I believe that they not only tried; I believe that they did, and I would like to just interrupt you—and then you can proceed as you would prefer to, but tell me one more time, so I can have a clear understanding of it, that as a result of this—or as a result of something, how many positions are there now—how many people are there now in the State of North Carolina involved with warning the public in the Second Congressional District and elsewhere that were not there before March 28?

Mr. FRIDAY. Let me ask Bob Muller to answer that directly.

Mr. **Muller**. There is no dedicated warning preparedness meteorologist. As Dr. Friday has announced, they are recruiting the position now and that position will be filled which will be a statewide position performing liaison, establishing spotter networks, working very closely with the Department of Emergency Management to establish community preparedness, but there are no positions dedicated completely to emergency management or warning preparedness in North Carolina at the present time.

It has to be taken out of staff and that's where our problem has been, covering out of staff when the staff has already been short, keeping vacancies or just through the bureaucratic process of filling a vacancy, having the person retire and having that person eventually replaced which may take anywhere from 3 to 6 months to fill that vacancy.

That job of that meteorologist must still be accomplished by somebody. Therefore, myself, or the deputy meteorologist in charge, are then required to work shifts, operational shifts, to perform the services that we must provide and that then takes from the time that we have then available to go out and do the public service work and the preparedness work that is incumbent upon the area manager to do.

Mr. **Valentine**. Well, are we talking the creation of a new position with new responsibilities to address some of the needs that have been discussed here by the media folks? We're talking about that on the one hand, but now, aren't we also talking about positions that were there in the table of organization that had not been filled previously that you plan to fill now?

Mr. **Muller**. All positions in North Carolina are presently filled or in the process of being recruited and we've gone through the personnel policies of advertising for vacancy and there are no vacancies that are presently——

Mr. **Valentine**. And how many of those positions have been filled since this disaster or the search for some person to fill them commenced after the disaster?

Mr. **Muller**. At the time of the disaster, we had two vacancies at the forecast office in Raleigh and neither one of those really pertained directly to the operations of March 28. On March 28, the staff was augmented by additional people working on an overtime basis so that our staff consisted of seven working meteorological persons and one contract specialist, so we had seven people working the night of the storm, although we were staffed short by two nonoperational positions, a supervising meteorological technician, I believe, and an electronics technician. But neither one of those were directly involved with the warning process and we did have sufficient staff to work the night of the March 28 storm.

The problem is in whether we had the sufficient staff over the ensuing years to handle the preparedness work that should have been done to establish the groundwork for community preparedness prior to the storm.

Mr. **Valentine**. What about the equipment, Dr. Friday, what about the radar systems? Do we have state-of-the-art equipment operating at Raleigh-Durham?

Mr. **Friday**. Across North Carolina, on the coast of North Carolina, Wilmington, and Cape Hatteras, we have what are referred to as WSR-57 radars. The 57 is the year that the radars were designed, 1957. Those radars are good radars, however, they are quite old and they are in—difficult to maintain and they do need replacement.

At Raleigh-Durham, we have a WSR-74C. That is a 5-centimeter C-band—that's another designation—it is a 5-centimeter local warning weather radar first designed in 1974. It is a good radar; it is a transistorized solid state radar. It is good as far as maintainability is concerned. The difficulty there is that it is a 5-centimeter radar, as contrasted to the 10-centimeter radar such as we have along the coast.

Five-centimeter radar has the advantage of being relatively inexpensive in contrast to the 10-centimeter which are more expensive. It has the disadvantage of in heavy rain situations the signal is absorbed by the rain so that you cannot really see past the first storm and that was the difficulty that Mr. Muller had on really identifying whether or not we had tornadic activity in those storms as they were moving through.

As the rain was falling on the radar and as the rain was surrounding the radar, the signal was being so attenuated, so weakened, that you could not detect beyond the immediate range of that. So although they knew that there were, indeed, storms out there, they appeared by all measure as being severe thunderstorms, as opposed to tornadic storms.

That is part of the problem that we had with making sure that we had issued the actual tornado warnings versus the severe thunderstorm warnings. We did have reasonable lead time on the severe thunderstorm warnings. Of course, as has been pointed out earlier, those do not have the psychological impact of the tornado warning. You do not get the heightened sense of awareness; you do not get the response from the public as you do in the case of a tornado warning.

Mr. VALENTINE. Well, what you're saying is that the sum of this old antiquated outdated equipment, whether here or elsewhere, can't tell the difference between rain and a tornado, but now——

Mr. FRIDAY. Now, we've recognized that, sir, for quite some time.

Mr. VALENTINE. Right. I understand that. I am not suggesting that maybe this is some great revelation that I—that this committee has enlightened you with, but isn't there something—this Doppler, D-o-p-p-l-e-r, radar, what are the Weather Service's plans with respect to that? We keep hearing about it. Has that kind of equipment been requested by the service? Have you asked Congress—as the chairman said, in addition to all other requests—not from you, but from others, to—for this weapons system and that sort of sophisticated thingamajig—have you asked the Congress for this new stuff?

Mr. FRIDAY. The—yes, sir, let me explain a little background on that and then tell you where we stand on the NEXRAD program, the next program on the Doppler Radar program. In the late 1970's, 1976 through 1979, we conducted a joint experiment at Norman, OK, with the Department of Defense, with the FAA and with NOAA on what was called the Joint Doppler operational project. At that time, we took the research Doppler Radar at the National Severe Storms Lab at Norman, OK. We used that in a parallel operation with our own forecast office in Oklahoma City. We staffed that radar around the clock. We used it to detect severe storms moving through the Oklahoma area in issuing warnings on that and proved to ourselves and to our organizations that, indeed, Doppler radar provided a significant improvement in our ability to detect and predict severe storm motion and tornado formation.

What the Doppler radar does, in addition to just simply seeing the cloud structure and seeing water droplets, as we have now, it actually measures the velocity of those water droplets, the velocity of those cloud structures. It allows you to literally look inside the cloud so that you can see what the winds are doing inside the cloud.

Doing this, then, allows us to see inside a thunderstorm and to see the formation of a tornado before it ever touches down and, as a matter of fact, even recognize the beginning of the circulation of a tornado well before it's actually—actually generated.

That, then, will give us the capability of being able to be sure of whether or not these storms actually contain tornadoes or building tornadoes are not, and in the case of the very strong tornadoes, such as the ones that moved through in the Carolinas here, should provide us with a substantial leadtime and a warning time that we can give the public.

In 1981, the NEXRAD program was formalized as a formal tridepartmental program. We're trying something a little different in the Federal Government from one aspect of things that we've done before. We've realized that the National Weather Service is not the only organization that requires good weather radar data. The Air Force and the Navy also require it for many of their installations and their operations and their own military weather services.

Likewise, the FAA requires very good weather information at some of their more remote locations or at some of their heavy—high-density airport operations. So consequently, we have a Department of Transportation, Department of Defense and Department of Commerce joint program to generate and produce the next-generation weather radar. That program began formally in 1981; it has been funded for the last 3 years; it is in the final stage of the prototype development and we're using a technique in our procurement of this that competes two major companies against each other to try to produce the best lowest cost radar.

We have two very qualified competitors working on this radar now, Sperry Corporation and Raytheon Corporation, both of which are very capable of producing extremely high-quality radars. They are now in the process of producing prototype Doppler radars for use throughout the National Weather Service, the Air Weather Service, the Navy Oceanography Command, and the FAA.

The first one of these radars will be available in late 1986 when we select the winning contractor before we go into the full-scale production. After we go into full-scale, or limited production with 10 units and then finally full-scale production, we will start introducing these radars across the country in the 1988 timeframe and that introduction will take place over approximately a 4-year period, from 1988 to 1992.

After we complete that, according to present plans, that will produce a network of next-generation weather radars, 10-centimeter Doppler radars across the country and that will eliminate a lot of the holes that we have now in our coverage areas. It will eliminate the difficulty we have with 5-centimeter radars now.

It will also help us not only in detection of tornadoes and severe storms; it will also assist us in measuring, by using the radar itself, the actual amount of rainfall falling in any section of the country in which the radar coverage is obtained to provide us information on flooding; to provide us information on soil moisture for farming and the general water management, as it—as the water management problem in this country becomes more and more important as we move toward the next century, the NEXRAD will also provide us a very good data base for the overall water management data that we need to be able to supply this Nation.

So, with the technology, we are—we recognize the difficulty with the radars for quite some time and we have been working on it as a coordinated program between all three departments and that program is well on track and well under target. I personally have sat and played with the controls on the prototype equipment that the manufacturers are generating and I am thrilled with the ability of that system.

Mr. VALENTINE. Does it have, Doctor, in addition to being more sensitive—if that's a good word—does it have greater coverage area?

Mr. FRIDAY. The radar itself, depending on what phenomena you are trying to look at, has a variable coverage area. On the coast, it will literally reach out 460 kilometers, 250 miles, basically, to be able to keep track of the hurricanes and tropical storms as they're moving in off shore, the same range as we have with the current radar.

We will be able to measure the velocities and the precipitation out to 100 to 125 miles. We will be able to detect internally in the clouds large tornadoes, F3, F4 of this sort, out to 80 miles from the radar. The smaller ones out to maybe 50 miles.

So as we—as we look at the different phenomena we're trying to observe, we will be able to detect a very wide range of phenomena over a very extended coverage area. It will have the same coverage as our present major radars, network radars, as far as the overall coverage is concerned, but it will allow us to do a lot more and provide a lot better information for the safety of life and property.

Mr. VALENTINE. Is this the same type of equipment that could, in an emergency, be used to—say, to identify and locate aircraft? Could this equipment be used also for national defense?

Mr. FRIDAY. This is not designed for that and, as a matter of fact, when—the weather radar is an interesting history in the whole history of science——

Mr. VALENTINE. It might be easier to get it if——

Mr. FRIDAY. Well, the Air Force——[Laughter.]

The Air Force Air Weather Service is also interested in this radar and they are a full participant in this program. So the protection—and as a matter of fact, before I came to the National Weather Service in 1981, I was working on the Secretary of Defense's staff as the Director of Environmental and Life Sciences and I basically was working at the time in the Department of Defense in which we decided as a corporate decision that this was a necessary thing for the department as well.

I was very happy to have been that part of the cog and then coming over to the National Weather Service now being on this side of the operation, so it is indeed beneficial for both. But weather radar started very interestingly. When radar was first developed in World War II to track planes, all of these fuzzy things kept getting in the way and those fuzzy things were clouds that we now observe and it's the weather phenomena. So there was a great deal of effort early on in the development of radar to eliminate all the fuzzy things until some bright individual decided it would be a good idea to separate that out and use that in a way——

Mr. VALENTINE. You can take that now and apply that to Washington, period, to move all the fuzzy things——[Laughter.]

You know, when you talk about that—I don't mean to interrupt you, but you know, I have to say things when they come to my mind because they leave sometimes, but I remember doing—during World War II—I got in on the tail end of that late unpleasantness—that the British who developed radar——

Mr. FRIDAY. Yes.

Mr. VALENTINE [continuing]. And perhaps is more responsible for the victory of our side than any other single thing that happened in the war, but I always thought this was so British that they measured—the radar was high, very high, oh, very high indeed. Official designations. [Laughter.]

How British. Go ahead, excuse me.

Mr. FRIDAY. I don't think I can top that. [Laughter.]

Mr. VALENTINE. Well, let me change the subject, then, to another thing that—another area. I'm just about through with this part of it.

You heard the media gentleman speak of—and all of us here are aware of their responsibility and the way that they discharge the responsibilities which they have to be the conduit for the information gathered by the Government when tragedies of this kind approach. And we've heard a conversation here about a lot of things that they really have to offer.

Mr. FRIDAY. Yes.

Mr. VALENTINE. Has there ever been any consideration, do you think, given to making a real effort to—for each side to benefit from the other's know-how and accumulation of experience and wisdom by dealings with a professional organization of weather people and seminars conducted in different areas in Washington, in making a real effort, or more of an effort to coordinate these two instruments that need to work together for public good when these tragedies occur?

Mr. FRIDAY. Yes, sir, you're absolutely correct on that, that there does need to have that kind of coordination, that kind of activity between the two of us, and I don't mean to say that as two separate camps because, as Mr. Campbell said in his presentation up here, this is really a team and we really try to make sure this team works and works well.

We have had, over the past several years, various workshops, various activities with the media. We had hurricane workshops just before Diana struck here in Carolina. In late May, we had one in

Wilmington and one at Raleigh. We also had one up in the Norfolk, VA, area and the people from the Cape Hatteras area came on up to that one, were invited to that one, so, as a matter of fact, over the last—in this springtime, we had a total of 29—if I remember correctly—media workshops in working with the local officials on what to do as far as the hurricanes were concerned.

We are starting to work additionally with getting ready for our next round of winter weather workshops. I'm going out to one in California here next couple 3 weeks from now with the media out there in the California, Nevada area and we'll be meeting there on the hazards of the snow and how we educate the public on that.

We have, in the American Meteorological Society, a committee on radio and television broadcasters. That is a growing committee. It is growing very rapidly as more and more of the—of the radio and television outlets turn and recognize the responsibilities in the area of meteorology and improve the staff of these various organizations and that committee—the last committee meeting I attended was in this June. There were 250 members there at that time and we talked back and forth at that time and we tried to exchange information.

We have a long way to go to make that work effectively, but it's at those kinds of meetings that—to use a colloquism, occasionally some of them will beat me about the head and shoulders about things that we are not doing right and occasionally I will reverse that process and we do work it out. We try to have that kind of open dialog and we're continuing to do that more and more as we move along.

We are emphasizing more and more the necessity of our local offices throughout the States, not only the forecast offices such as Bob Muller heads, but some of the smaller offices, that they work very closely with their media, and indeed, most of them do. Occasionally there will be a personality clash, as there is in any sort of interaction of that nature, and we have managed to resolve most of those. But we are working in that area and we need to do more.

One of the things that I'm doing in response to recommendation No. 1 is I am initiating a major management study—I hate to use that term "management study" because it's not really that at all—but I'm initiating a major study of our entire warning and preparedness program across the United States this year. I'm not doing it with a meteorologist; I'm doing it with a sociologist, someone who knows how people react to things, as opposed to somebody who knows how to write equations defining the motion of air.

I'm doing that with an individual that we have on an interpersonal Government act appointment from the University of Minnesota who will be examining how we do—what we do and how we do it at 20-some-odd locations across the country, sampling the entire country, and coming to me by the end of the year with recommendations on how to improve that; how to improve our communications with the media; how to improve our communications with the public.

We're doing that and I expect great things to come out of that because he's the one that helped us in our probability workshops and those have been—in the hurricane workshops—and those have been very successful. We hope to see great results from that.

Mr. VALENTINE. Dr. Friday, going to another matter, don't you think that it's—that it would be a good idea to kind of change this policy if, indeed, it is a policy of the Weather Service, to select one media outlet? I can kind of understand Andy's chagrin. You're sitting here, you know, in a competitive business and, of course, he thinks he's better than anybody else and so on——[Laughter.]

Then you look at—lo and behold, he gets a phone call from his good friend but fierce competitor, in a good-spirited way, and he says, "Andy, would you like to know what's going on with the Weather Service, like to know where that storm is? I can tell you because the Federal Government just called me." Don't you think it would be a good idea to try to change that policy?

Mr. FRIDAY. Let me make a couple of statements and then Bob Muller is dying to make a comment on this one himself, I think, on this one.

First of all, I want to say that I was very impressed and I appreciated the comments of all of the media representatives that were here on the panel, too. They did a very, very good job. Their points are very well taken and I certainly appreciate the remarks they made, both the pluses and the minuses because I understand their concerns——

Mr. VALENTINE. Did you notice the way the cameras peeled off as each one of them finished?

Mr. FRIDAY. I expected that——[Laughter.]

And you noticed what's left here, but that's all right. [Laughter.] That's fine.

Mr. VALENTINE. OK.

Mr. FRIDAY. But the—so I appreciated that.

First of all, the tower that went down, the weather tower, the National Weather Service doesn't own those towers. We simply deal with the local telephone companies to establish a communications network to pass that information on, and that's what we have always done, and in a lot of cases where we deal with telephone lines, we do have problems along this line and we try to make sure that we have some other recommendations—other backup means. Indeed, we're working on backup procedures for the Carolinas now as a result of this.

Microwave links usually hold up. It's very—relatively seldom that an entire tower will collapse of this nature, although it does happen occasionally, so, first of all, I did want to clarify the point——

Mr. VALENTINE. Like when a tornado comes through.

Mr. FRIDAY. When a tornado comes through, the tower will probably go if it hits. [Laughter.]

Second, I think you're absolutely correct that we do try to maintain complete, total, equal contact with the media. That's one of the reasons that we have set up the NOAA Weather Wire in the first place. We had a situation here, which was the disaster of all disasters, occur. We had a problem with the local wires; we had a problem with the—we knew that NOAA Weather Radio was still broadcasting, and as a matter of fact, when Alicia hit the coast of Texas a year and a half ago, NOAA Weather Wire—Weather Radio was the only thing left on the air during that entire time, and there were two radio stations that continued to rebroadcast that during the entire—entire episode.

But I think Bob might want to clarify exactly what happened along this line now that night, but it was—first of all, it was a disaster. There was no doubt about it. There were seven—seven people in there working in a space that is ordinarily occupied by two, three at the most, trying to cover all of these areas, trying to make sure, trying to dial up our own radars at Wilmington and at Hatteras and elsewhere to see what was really going on since he was in the process of being blinded by the rains that were falling on his at the time, information contacts with some of the local officials working through the emergency coordinating channels. It was, indeed, an absolute flurry of activity at that time, so with that as a scene, let me turn that over to Bob, I think.

Mr. MULLER. Mr. Chairman, our communications, our primary source of communications was out at the time. I know Weather Wire System. I know Weather Radio was operating fine.

I, then, had the responsibility of disseminating warnings to a large number of radio, television stations, as large a number as I possibly can at one fell swoop.

There are two radio networks that encompass the eastern part of North Carolina. I'm familiar with those two radio networks. I called the stations involved with two of those networks. The one station was WRAL, which is a member, I believe, it's the North Carolina news network, which is comprised of 82 different radio stations in North Carolina and I think it's written up in the "Disaster Survey Report."

The purpose being to rely to Greg Fishel to rely this message to the entire North Carolina news network, thereby serving 82 radio stations with one call.

The second radio station that I called, which is also a flagship of a North Carolina news network; when I contacted them, their response was, "I'm sorry; we are already loaded with weather," so I discontinued attempting to get back to them again.

I did call—all the calls were made from my own office, not from the actual work area because I was the seventh person on duty. Our severe weather coordinator was very involved in issuing statements, issuing warnings at the time, and I went back into my office, which is just an administrative type office, and I went through the telephone listings that I had and I contacted the telephone numbers that I had in my office.

Unfortunately, the telephone number that I had for WTVD was an administrative number and there was no answer at that phone number when I tried calling. I did not have the emergency or switchboard number, which, I've got to admit, that was my fault and Andy Park has now made available a list of about nine different telephone numbers that I can reach them——

Mr. VALENTINE. I'll bet he has.

Mr. FRIDAY [continuing]. I can reach somebody on the staff or I can reach somebody in the news department to contact WTVD. That's very loudly displayed in my office.

But there was no attempt to provide any favoritism. The attempt was made to provide the widest dissemination that I could with the least amount of time, and that's why WRAL was chosen. They are the flagship station, or at least one of the radio stations on the North Carolina news network stations.

One of the things, sir, that will occur with a dedicated warning preparedness meteorologist is that the wrong telephone numbers won't exist again and that happens so often unless someone is really paying attention to it and we all recognize that, and regardless of best intentions, telephone numbers change, contact points change and with—I don't know how many individual contact points that Bob probably has in the State, but many of these run up almost into the hundreds in many of our offices around the country.

Mr. VALENTINE. Well, is that the policy, not just with this storm, but is that what would happen, at least up to this point, with respect to hurricane warnings which you just—which you call—would you do the same thing?

Mr. MULLER. We would call the CPCS-1 station of the EBS network. There are three CPCS-1 stations. They are control stations for the Emergency Broadcast System. There are three of them in eastern North Carolina and the arrangement has been made through our office to work with the North Carolina Association of Broadcasters to disseminate via the EBS system all warnings, hurricane warnings, around the coast of North Carolina. We do not call all radio stations with the bulletin, but we do call the CPCS-1 stations which are those stations chosen by the North Carolina Association of Broadcasters.

Mr. VALENTINE. But would it be practical to solve this problem by having an updated transcription and make a number available to these stations, a place where they could call periodically? Would that be practical?

Mr. MULLER. It would be possible. I don't know that one number would suffice. If you use one number in the State to serve to provide a complete breakdown of hurricane information for the media, you would have an overloaded phone line and you would not have people getting accessibility to it. Bear in mind that we have already heard comments from some media that they were unable to contact the National Weather Service on unlisted phone numbers. I think that may be a problem that we'd have if we had a recording line available.

Normally, Mr. Chairman, the North Carolina weather wire is in operation. In this situation, it was not in operation. That's why we went to the telephone to make distribution.

Mr. VALENTINE. Well, what about the situation that exists or existed—in another life, I was involved with a boat at one time and there was a station that you could—or regular channel that you could tune in and if you were close enough—and I think there were two or three stations on the coast of North Carolina, and they broadcast weather continuously 24 hours a day.

Mr. FRIDAY. That is the——

Mr. VALENTINE. Why—wouldn't that be practical for the inland areas of this State and Nation, in addition to the coastline?

Mr. FRIDAY. That is the NOAA weather radio transmissions that you were listening to, sir, and initially those were placed in operation solely for the boaters in the—what was that—1971-72 timeframe? The original NOAA weather radios were only for the coastal areas and they were placed right along the coast——

Mr. VALENTINE. But they are now—I mean, could these guys have a radio and tune it in and get this stuff?

Mr. FRIDAY. We do have that and that's one of the ways that they used the NOAA weather transmission—that they used for backup, but again, as pointed out, and although we're looking in it and that's another of our action items, there are some sections of the State that do not receive NOAA weather radio transmissions and there are some of the larger distributors of—media distributors, television stations, that cover areas that are not—that exceed one single radio transmitter area.

We could take a look under emergency situation at the programming that goes on NOAA weather radio and to see what we could do about trying to cover some larger areas with that, but that would be a possibility. We could certainly take a look at that. That's some of the things that—that's some of the areas that I, again, I don't want to try to solve the problem right here across the table today, but that's some of the areas that the disaster preparedness or warning preparedness meteorologist can certainly address to try to approach those sorts of unique solutions in the particular States.

Each State, fortunately or unfortunately, depending upon your own particular view of your State loyalty, each State is different. Each State has a different infrastructure that we have to deal with. Each State has a different internal preparedness organization of its own and we have to be able to work with each State on their terms in this cooperative manner.

So that's one of the reasons that I can't say from a national level that this is the way that we'd be doing it automatically. I've got to leave that up to the people that we entrust with running your offices here.

Mr. VALENTINE. Thank you very much, Dr Friday.

The committee will recess until 2 this afternoon.

[Whereupon, at 1:07 p.m., the subcommittee was recessed, to reconvene at 2 p.m., the same day.]

AFTERNOON SESSION

Mr. VALENTINE [presiding]. The hearing will come to order.

Our final panel today will be the Honorable Fred Turnage, mayor of Rocky Mount; Brian Brantley, Nash-Edgecombe Emergency Management Agency; Thomas Pugh, director, division of emergency management of the State of North Carolina; and Ellis Stanley, director, Durham Emergency Management Agency. We are delighted to have you gentlemen here to present testimony from your individual vantage points.

I am happy to recognize Mayor Turnage at this time.

STATEMENTS OF HON. FREDERICK E. TURNAGE, MAYOR, ROCKY MOUNT, NC, AND CHAIRMAN, EDGECOMBE-NASH EMERGENCY MANAGEMENT COUNCIL; BRIAN H. BRANTLEY, COORDINATOR, EDGECOMBE-NASH EMERGENCY MANAGEMENT AGENCY; JESSE T. PUGH III, DIRECTOR, DIVISION OF EMERGENCY MANAGEMENT, NORTH CAROLINA DEPARTMENT OF CRIME CONTROL AND PUBLIC SAFETY; AND ELLIS M. STANLEY, SR., DIRECTOR/COORDINATOR, DURHAM COUNTY EMERGENCY MANAGEMENT AGENCY

Mayor TURNAGE. Thank you, Mr. Chairman. I am pleased to appear before you today on behalf of the Edgecombe-Nash Emergency Management Council, and I am pleased that another member of our council is here, Mr. Frederick Cooper, chairman of the Nash County commissioners, who is one of the two Nash County representatives. Mr. Cooper is in attendance today, also.

Mr. VALENTINE. Let me ask Mr. Cooper if he will stand up. He's a good man. He's chairman of the board of commissioners and he is my neighbor. We're delighted to have you here.

Mayor TURNAGE. As is customary, Mr. Cooper manages to sit beside a nice, attractive lady, and that particular person happens to be Miss Sandra Ray, who is aging coordinator for the regional council of governments and has assisted us in clerical portions of our report.

We do thank you for the opportunity to speak before you today, Mr. Chairman. The Edgecombe-Nash Emergency Management Agency has served Edgecombe and Nash Counties and the city of Rocky Mount for approximately 20 years. This agency is a cooperative effort funded by both Nash and Edgecombe Counties, and a Federal grant which is administered through the State of North Carolina. I am pleased to serve as chairman of the agency, and it is in that capacity that I speak today.

On March 28 of this year our agency and many other emergency service agencies in our region were put to work. Fortunately, the area that was struck by the tornado in the Nash-Edgecombe area was relatively small and occurred only in Nash County. At 9:30 p.m. on that evening a tornado struck the West Mount community of Nash County located approximately 4 miles southeast of the city of Rocky Mount. The tornado traveled in a northeasterly direction for approximately 1 mile, causing a considerable amount of property damage and only one personal injury along its path.

Damage estimates totaled $581,000. Forty-one homes, two businesses, and several automobiles were damaged. We were very fortunate in that the bodily or personal injury reported was only a minor one.

The emergency service response to this situation was excellent, as well as the response by the public. The people of the West Mount community are deserving of our congratulations on the courage and preparation they exhibited during the entire ordeal.

The response of both the State of North Carolina and our local agencies was excellent. The planning and training and preparation that had been done on a day-to-day basis prior to this obviously paid off during the emergency.

One major area of concern during the storm, however, was the warnings prior to the tornado. In the Nash County area we received a tornado watch alert at approximately 3 p.m. on March 28. However, that was the last severe weather information that we received until the tornado was over. Subsequently we learned that North Carolina's warning problem was in part caused by the tornado that destroyed the microwave relay town at Maxton, NC. The tornado had knocked out the entire North Carolina weather wire system at approximately 7:15 p.m. and apparently accounted for Nash County receiving no further notice.

This weather wire service is a major link between the broadcast media and other key agencies, including Nash County's communication center. After reviewing the "Natural Disaster Survey Report" to the administration, dated July 1984, that has been reported on earlier today, there is obvious cause for concern about the future of warning coordination in North Carolina. The findings of these reports indicate staff shortages within the National Weather Service offices in North Carolina, and these appear to be acute. The report also indicates some shortcomings with the radar equipment now being used by the National Weather Service. We feel that the Weather Service was doing everything they could do within the resources available to them. It appeared, however, that the resources both in terms of staff and equipment were lacking.

On the positive side, I am pleased to say that we were happy with the cooperation and coordination that existed between local, State, and Federal officials on this occasion. The State and Federal officials stayed in touch and provided guidance to us during the disaster relief effort.

Based upon our local experience, the Weather Service field office at Raleigh has done an excellent job of establishing and maintaining a close working relationship with State emergency management officials and the media within its immediate area. However, the apparent staff shortages have prevented the Raleigh office from establishing ties with local officials such as our agency and possibly the media in many of the more distant counties within the offices' warning area.

In conclusion, let me say that I have had an opportunity to review the "National Disaster Survey Report" dated July 1984, as it applies to our geographical area. I concur with its findings and urge your favorable consideration of the recommendations contained within the survey report.

I am pleased to have with me today Mr. Brian Brantley, the executive coordinator of our agency, who was the man on the scene at the time and who would conclude our presentation with his remarks.

[The prepared statement of Frederick E. Turnage follows:]

Edgecombe-Nash Emergency Management Agency

P. O. BOX [illegible]
ROCKY MOUNT, N. C.
[illegible]

TELEPHONE [illegible]

BRIAN BRANTLEY
COORDINATOR

EMERGENCY MANAGEMENT COUNCIL

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MAYOR
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REV. GEORGE DUDLEY
COUNCILMAN
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F. B. COOPER
NASH COMMISSIONER
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GUY BARNES
EDGECOMBE COMMISSIONER
ROCKY MOUNT

REV. THOMAS L. WALKER
EDGECOMBE COMMISSIONER
ROCKY MOUNT

Statement By
Frederick E. Turnage, Chairman
Edgecombe-Nash Emergency Management Council
Before
U. S. House of Representatives
Subcommittee on Natural Resources, Agriculture Research and Environment
James H. Scheurer, Chairman

October 18, 1984 Rocky Mount, NC

Subject: Tornado and Severe Storm Prediction Efforts

Mr. Chairman and members of the Subcommittee on Natural Resources, Agriculture Research and Environment, thank you for the opportunity to speak before you today.

The Edgecombe-Nash Emergency Management Agency has served Edgecombe and Nash counties and the City of Rocky Mount for over twenty years. The Agency is a cooperative effort funded by the two counties and a Federal grant which is administered through the State of North Carolina. I am pleased to serve as Chairman of the agency. It is in that capacity that I speak today.

On March 20, 1984, our agency and many other emergency service agencies in Nash County were put to work. At 9:30 p.m. a tornado struck the West Mount community approximately four miles southeast of the City of Rocky Mount. The tornado traveled in a northeasterly direction for approximately one mile, causing considerable property damage and one injury along its path. Damage estimates totaled $581,000.00 Forty one (41) homes, two businesses, and several automobiles were damaged. We were very fortunate in that the bodily or personal injury reported was minor. Emergency service response was excellent as well as public response. The people of the West Mount Community are to be congratulated on the courage they exhibited during this entire ordeal.

The response of both state and local agencies was excellent. The planning, training and preparation being done on a day to day basis paid off during this emergency.

One major area of concern during the storm was the warning prior to the tornado. We received a tornado watch alert at 3 p.m. on March 28, however, we received no further severe weather information at all. Subsequently, we learned that North Carolina's warning/disseminating problem was inpart caused by the tornado that destroyed the National Oceanic and Atmospheric Administration's microwave relay tower at Maxton, North Carolina. The tornado knocked out the entire North Carolina National Oceanic and Atmospheric Administration Weather Wire Service at approximately 7:15 p.m. This Weather Wire Service is a major link between the broadcast media and other key agencies including Nash County's Communication Center. After reviewing the Natural Disaster Survey Report to the Administrator of the National Oceanic and Atomospheric Administration dated July, 1984, there is cause for concern about the future of warning coordination in North Carolina. The findings of this report indicate staff shortages within the National Weather Service offices in North Carolina. The report also indicates some shortcomings with the radar equipment now being used by the National Weather Service. We feel the Weather Service was doing everything they could with the resources available to them. It appeared that resources both in staff and equipment were lacking.

On the positive side, let me say, we were quite pleased with the cooperation and coordination that existed between local, state and Federal officials. State and Federal officials stayed in touch and provided guidance to us during the disaster relief effort.

Based upon local experience, the Weather Service Field Office at Raleigh has done an excellent job of establishing and maintaining a close working relationship with State Emergency Management officials and the media within its immediate area. However, the apparant staff shortages have prevented the Raleigh office from establishing ties with local officials and possibly the media in many of the more distant counties within the offices' warning area.

In conclusion, I have reviewed the Natural Disaster Survey Report to the National Oceanic and Atmospheric Administration dated July, 1984, and as it applies to our geographic area. I concur with the findings and urge your favorable consideration of the recommendations within the survey report.

Thank you.

Mr. **Valentine**. Thank you very much, mayor.

Mr. Brantley.

Mr. **Brantley**. Thank you, Mr. Chairman.

In a letter dated October 10, 1984, Congressman Scheuer asked me to discuss four topics. No. 1, was the State and local efforts to mitigate damages and loss of life during severe storms. One thing I would like to mention is that the coordination between the State and local government in this—in these mitigating efforts—is extremely good. We have a natural disaster plan for Nash and Edgecombe County that includes a tornado annex. Both those plans have been approved by the county commissioners and by the State division of emergency management. They are updated and tested periodically. Public information presentations to civic groups, churches, industry and emergency services, I feel this is very helpful in preparing for a severe storm or any type of disaster. Annual tornado drills in our schools, this is very helpful and has been for the child that knew how to get into correct positions during a tornado.

We participate in the tornado awareness week proclaimed by the Governor. There we have a more or less statewide tornado drill involving the schools, also. Media presentations, tornado season, the media in the area contacts me or several agencies and we try to get public information to the public concerning tornado safety. Tornado shelter inspections, going to the schools. The division of emergency management engineer has talked with the local coordinators and told them the safer places to go in schools, industries, and we can go out on the local level and pass this information to industry and schools and churches.

Then, of course, we have disaster drills periodically, involving emergency services, the public, and also the hospitals in both counties. I feel this is very important. After the fact, on March 28, we sat down and we discussed things, on how we did things right and what we did wrong. The overall view was that we handled it as well as we could, but we did make some errors and we learned from it. So these, I feel like, are some things that we do to try to mitigate the damages before the fact, and this also helps us prepare for the entire situation.

No. 2, the second thing that I addressed was the performance of the National Weather Service during the Carolina storms of March 28. As Mayor Turnage stated, we received a tornado watch at approximately 3 p.m. on the 28th, and he also stated that was the last severe weather alert that we received at our communications center. We have three means of receiving severe weather in our communications center in Nash County; that is, the PIN terminal, the police information network, which in my personal opinion is a total waste of time for severe weather alerts. Every time we have severe weather in Nash County, or we have lightening or thunder, the PIN is put down intentionally to prevent any type of damage to the PIN terminal.

We have the NOAA weather wire. Of course, that went out with the microwave tower in Maxton. And we had the NAWAS phone, the National Warning System. Our warning system phone in the communications center was not activated that night. Our dispatchers received no call on that phone during the night.

The tornado struck at 9:30. The mayor referred to the natural disaster report to the NOAA Administration stated that our tornado struck at 8:10 p.m. The first report we got was 9:30. That was from the Rocky Mount police department and within 6 minutes we had several calls. So we feel like the tornado touched down somewhere around 9:25 or 9:30.

The survey prepared by the survey team showed staff shortages in the National Weather Service office, and equipment unable to track the tornadoes. This, we feel, was very crucial and why we didn't get severe weather alerts in our communications center. We received several alerts on Diana, Hurricane Diana. We went across—our communications system contacted all the emergency services, fire, rescue, and law enforcement, and told them to be prepared for any type of severe weather that could occur during the night. Check generators, check their resources such as blankets and so forth. This would have been very helpful if we could have gotten this information to our local emergency services people the night of March 28.

I feel that the Weather Service was hindered by these shortcomings and they did all they could do with the resources they had available. I feel like the Weather Service office is very professional and they are dedicated.

No. 3, whether any improvements could be made to reduce destruction by improving prediction and communication.

I had a little problem with this question in that the word "destruction" sort of bothered me. I look at destruction as property damage. In the tornado situation I feel like that you can do some things to prevent property damage—maybe moving cars to safer places or getting tractors out of fields. But the damage is inevitable in a tornado. However, the loss of life or injury, the prediction time and communication to the public and to emergency services people, and to weather analysts such as we heard from the panel this morning, it is very important. I feel like prediction and communications could certainly help in saving lives and reducing injuries.

No. 4, the necessity for greater coordination and cooperation between local, State, and Federal officials during severe weather. I will address the National Weather Service first.

I feel that with the technology available, whether it be phone line or something else, that there could be some way of warning. I know the national warning system is supposed to be effective, but we have sort of found it to be ineffective. Maybe it can be fine-tuned. But some type of warning system to local emergency services or warning points within the State. I don't know how many there are in the State. We've got one in Edgecombe and one in Nash County. So this would certainly help in getting the message to the emergency services people.

When these emergency services people hear things in a community, then they tell somebody, then the message passes that we could have severe weather or there's a tornado warning or watch. So I feel like that would be very helpful.

The coordination and cooperation between the State and local governments on a day-to-day basis, in my opinion, is excellent. The North Carolina Division of Emergency Management has not—any time that I have been to the State for any assistance, they have offered it. They have put on some excellent workshops for us, hurricane preparedness. The day we had the tornadoes we had been in Raleigh that day talking about the different hazards facing our county. Through their formulas, that day we figured that Nash County's most likely disaster was a tornado. That night we found out that it was. So I think they put on some excellent workshops and provide excellent training.

The Federal officials during the disaster assistance center, they were very cooperative. The damage assessment teams came in. We went house to house and went through with the Federal damage assessment. They were very cooperative.

I was very pleased that Congressman Valentine's office was in touch with me the next day expressing concern over what had happened in Nash County. His office also called me back during the disaster relief effort for more updated information, and I felt like this was certainly helpful. Nash County itself, being a two-county agency, we work with both county governments. Mr. Cooper serves on the emergency management council and is also the chairman of the board of commissioners in Nash County, was very helpful. He was contacted. He said if we can help anybody by applying for Federal assistance, if we can just have one, then we have accomplished something. So we did apply for the Federal disaster assistance. He was there at the disaster center and very helpful, as well as the other officials in Nash County.

So, overall, I feel like that the biggest problem that I saw was the warning before the tornadoes. I hope that something can be done, certainly by people more experienced in communications than myself, but I think we have all seen that the problem does exist in getting the warning to the public and to local emergency services people.

Thank you.

[The prepared statement of Brian Brantley follows:]

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Statement by
Brian H. Brantley, Coordinator
Edgecombe-Nash Emergency Management Agency
Before
U.S. House of Representatives
Subcommittee on Natural Resources, Agriculture Research and Environment
James H. Scheuer, Chairman

October 18, 1984 Rocky Mount, NC

I would like to thank you Mr. Chairman and other members of this subcommittee, for this opportunity to speak before you today. In your letter of October 10, 1984 you asked me to discuss the following: (1) state and local efforts to mitigate damages and loss of life from severe storms; (2) the performance of the National Weather Service during the severe Carolina storms of March 28; (3) whether any improvement could be made to reduce destruction by improving prediction and communication; and (4) the necessity for greater coordination and cooperation between local, state and Federal officials during the presence of severe weather outbreaks.

(1) State and local efforts to mitigate damages and loss of life from severe storms.

Several programs are in effect both on the state and local level to mitigate damages and loss of life from severe storms. These programs include, disaster plans approved by local and state officials that are tested and updated periodically, public information including severe weather safety presentations to civic groups, church groups, schools, industry and emergency services, annual tornado drills conducted with assistance from the state, participation in tornado awareness week proclaimed by the Governor, alert and notification procedures for essential personnel, tornado shelter inspections for schools and industry, media presentations, and periodic disaster drills involving the public, emergency services and hospitals.

(2) The performance of the National Weather Service during the severe Carolina storms of March 28.

The early tornado watches on March 28 provided by the Weather Service were very effective in alerting the public. The watches had long lead times and were very accurate in determining the areas that could be affected. However, in Nash County our communication center did not receive any further update concerning severe weather. A survey prepared for the National Oceanic and Atmospheric Administration, dated July 1, 1984, reported that the NOAA weather wire microwave relay tower near Maxton was destroyed and severely curtailed statewide communications. The survey also concluded that the Weather Service Forecast Offices were understaffed and the radar detection equipment in use at that time was unable to track the tornado producing supercell or to ascertain severe weather signatures. These problems certainly hindered the Weather Service in providing adequate warning to local agencies.

(3) Whether any improvements could be made to reduce destruction by improving prediction and communication.

In a situation such as the one that occured on March 28, 1984, destruction is inevitable. Improving prediction and communication would not likely reduce destruction of property. However, improving prediction and communication in order to provide earlier warning would enhance public awareness and possibly reduce injuries and loss of life. Communication from the Weather Service to the local warning points should be improved if possible.

(4) The necessity for greater coordination and cooperation between local, state and Federal officials during the presence of severe weather outbreaks.

The coordination and cooperation between local and state officials is very good at this time. Within thirty minutes after the tornado in Nash County, the N.C. Division of Emergency Management representative was on the scene. The county and state officials worked closely many days after the tornado also.

Congressman Valentine's office contacted me the day after the tornado and again during the disaster relief effort seeking updated injury and damage information. Overall, I was very pleased with the coordination and cooperation between all levels of government.

Thank you.

Mr. VALENTINE. Thank you very much, Mr. Brantley.

Mr. Thomas Pugh.

Mr. PUGH. Thomas Pugh, Mr. Chairman.

I would like to express my appreciation for the opportunity to meet with you today to discuss North Carolina's response to the March tornadoes, and I will probably in my comments mention something about the response to the hurricane also, but also remark on how we might better provide services, particularly in regard to the National Weather Service.

I have divided my comments into two parts. The first part was going to be a slide presentation. You have seen several slide presentations already this morning, and with your concurrence I will just do away with the first part and jump right into the last part, if that's all right——

Mr. VALENTINE. All right.

Mr. PUGH [continuing]. And we can go through this very briefly, whichever you prefer, Mr. Valentine.

Mr. VALENTINE. Unless you think it will add something that the previous demonstrations of this kind has not covered, I don't think we need to go through that.

Mr. PUGH. OK.

Mr. VALENTINE. I agree with you.

Mr. PUGH. Fine, sir.

What I would like to do is touch on a few comments that were made today and reinforce some shortcomings that we saw.

Specifically, though, in my prepared comments, I would like to address those first. In the State of North Carolina we have developed what we call the State emergency response team, which is a team of managerial level professionals in State government, that when we have an impending disaster to go to or near the scene of the emergency to bring all the State resources to bear. In essence, it is a team of professional State employees. In reality, though, the National Weather Service plays a very big part on that team, not only in the weather-related emergencies but also in other types of emergencies as a large-scale chemical spill or even an accident at a nuclear powerplant. We need the Weather Service's expertise.

We are fortunate in North Carolina to have a fine and cooperative Weather Service staff. Without this cooperation, the State of North Carolina and her citizens would have no doubt suffered a great deal more during the recent disasters which struck our State.

For example, the State of North Carolina, with the help of the National Weather Service, has just recently updated its hurricane procedures and is embarking on an even more comprehensive and detailed study of hurricane evacuation. A few weeks prior to Hurricane Diana, a member of the Weather Service staff and members of this Division conducted workshops in which elected officials and key emergency personnel from each of the coastal counties walked through hurricane operations using the new plan and a scenario developed by the Weather Service. The effectiveness of this type of exercise is evident. When Hurricane Diana came ashore, evacuation plans and procedures went smoothly and we experienced no loss of life around our coast. This type of preparedness effort needs to be expanded. I was pleased to learn this morning that the National Weather Service is going to give us a warning preparedness meteorologist slot in the Raleigh-Durham airport, so the hearings are bearing fruit already and I congratulate Mr. Valentine on this.

I understand that staffing shortages which have long plagued the operations at Raleigh-Durham are now being alleviated, no doubt as a direct or indirect result of these hearings.

My concerns are, however, no matter how well we staff these offices, unless we provide these professionals the most current equipment, the services that they deliver will continue to be less than optimal. The 5 centimeter radar currently being used at Raleigh-Durham needs to be upgraded to a more effective system. The 10 centimeter system could be employed, which I understand would take additional staffing to be effective, and we need to get to the Doppler system as soon as possible.

No matter how sophisticated, advanced and accurate our forecasting mechanisms may be, unless we are able to convey this warning to the public, our efforts are in vain. The backbone of this system and its weakest link—it was addressed by three or four individuals today—is the Emergency Broadcast System. There is no effective way of transmitting warnings from decisionmakers in government through the media to every individual in the public. We rely very heavily on the media and they do an excellent job based on the problems they sometimes have.

The Emergency Broadcast System exists only as a result of voluntary compliance by the broadcast media. There is little or no Federal support for this system. In fact—and this concerns me greatly—the Federal Communications Commission is proposing to completely wash their hands of the Emergency Broadcast System. If this becomes a reality, there will be little or no way to adequately warn the citizens of impending danger.

I should add that the move by the FCC to divest themselves of the EBS is not supported, my understanding, by the broadcast industry. They realize, as I do, that the regulatory authority exercised by the FCC in other broadcast areas implies indirectly some authority in EBS.

The Federal Emergency Management Agency is posturing itself to take over this system. This agency, while it does provide some funding for hardening transmitter sites—in other words, making them bomb-proof—it has little comprehension of the EBS problems. For your information and background, I have provided a series of letters from my office to the Federal Emergency Management Office and their replies.

In summary, the National Weather Service should be commended for their fine cooperative efforts. They should, however, be provided manpower and equipment to make these preparedness and warning efforts even more effective. The Emergency Broadcast System, the key to this warning system, should be strengthened. Participation should be mandated by the FCC. The Federal Emergency Management Agency funding of the Emergency Broadcast System should be shifted from the hardening aspects and additional funding be provided to allow the States to work more closely with the broadcast media and to provide to our EBS system auxiliary power.

In closing, I once again would like to express my appreciation for the opportunity to make these brief remarks to the committee. Thank you, Mr. Valentine.

[The prepared statement of Jesse T. Pugh follows:]

INTRODUCTION

Mr. Chairman, and members of the Subcommittee, I appreciate the opportunity to meet with you today to discuss North Carolina's response to the March tornadoes, and how we might provide better services, particularly in regard to the National Weather Service.

I have, at the suggestion of Committee staff, divided my presentation into two parts. The first is a slide presentation which I hope will vividly show the Committee and members in the audience the massive devastation that these storms caused. This presentation was prepared for and shown to a national association of local Emergency Management coordinators, which may explain its tone and slant. I am showing it here with very little modification, but I do think it will give the committee a good overview of the storms and their effects.

The second part of my comments will address the warning system, its problems, and my recommendations for improvements. These comments will be very brief.

SLIDE PRESENTATION

Nationwide it has been an extremely bad year for severe weather. We had our share on the night of 28 March 1984. It turned out to be an extremely eventful evening. What I would like to do today is tell you about some of the good things that happened and about some of the bad things that happened during our response to the tornadoes. Hopefully this might save you similar problems in the future. I would also like to point out some of the unique difficulties that we experienced in responding to a tornado rather than, say, a hurricane.

SCOPE

The tornadoes ranged from the south side to the north side of the state, an extremely large area covering about 235 miles. Even though it did considerable damage, we were fortunate because if the storm track had been 10-15 miles west of where it actually was it would have hit several large population centers. If that had happened, I estimate that the death toll would have increased by a factor of ten. That same evening there were other problems going on in the state. A single tornado touched down in Mecklenburg County and a tornado and a flood occurred in Union County. From all reports, the storm put on an awesome display of electrical fireworks and boiling clouds. Although it was already dark when it entered the state, lightning flashes reportedly provided sufficient light to illuminate the clouds. Even before reports of tornadoes began to filter into the state, eyewitnesses realized that this was not an ordinary storm. It was obvious from the beginning that it was extremely powerful. This slide will give you an idea of the devastation it created across the state. 44 people were killed, 810 people were injured, 2,279 were left homeless. The monetary loss was estimated to be $104,628,000. Approximately 25,000 acres of timber was also lost. Its effect on people was obvious. There was much suffering.

From an emergency response point of view, this slide will probably interest you in that it illustrates the time line during which critical events occurred. The state received the first report of damage at 7:29 p.m. Shortly after 8:00 p.m. we began to get the first rough idea of the extent of the damages. It was shocking as the figures began to roll in. Soon after 9:00 p.m. the State Emergency Operations Center in Raleigh was activated, and by 10:00 p.m. it was fully staffed. The Emergency Operations Center staff varied, but about 150+ people could be found in the EOC at any given time. Fortunately, the numerous major exercises we conducted over the last few years, mainly in support of commercial nuclear facilities, provided us the training and the hands-on experience to get the job done.

I should pause at this point and say a word or two about our operational concept. Several years ago we formed the State Emergency Response Team. The Director of the Division of Emergency Management is generally the leader of this team. The team has members from every state agency on it. Its makeup for a specific emergency response depends upon need. The team can vary from two members to several hundred. Generally speaking, during a major emergency 150-200 members work in the SERT headquarters. This concept has worked very well for us. Each emergency response function is assigned to a lead agency who is responsible for the accomplishment of that particular function. Frequently, lead agencies draw assistance from other agencies who function in a support role. Overall coordination is provided by the State Emergency Response Team Leader. The Division of Emergency Management provides the necessary supporting and operating staff for the SERT headquarters.

Continuing, you will note that the Disaster Field Office was established on the 2nd of April and was not fully closed until the 23rd of May. But do not be misled. We are still deeply involved with administering disaster assistance.

KNOWN TORNADOES

The tornadoes that came through North Carolina that March evening were very powerful and they caused tremendous damages. This slide will give you an idea of the strength and number of tornadoes that North Carolina experienced that evening. The scale of the tornadoes are listed on the left-hand column. The wind speeds for the various scale tornadoes are shown in the middle column. The number of tornadoes we experienced of each type is shown in the right-hand column. The scale for tornadoes ranges from F1 to F5. Thankfully we did not experience any F5 strength tornadoes. The number of tornadoes shown for scales F3 and F4 have recently been changed based upon further study of available evidence. It is now believed that we experienced four F3 tornadoes and four F4 tornadoes. To give you an idea of the strength of an F4 tornado--consider that well-constructed houses are leveled; structures with weak foundations blow off some distance and cars are thrown and disintegrated. The National Weather Services speaks of the storms that night as family of tornadoes. Families of tornadoes of this magnitude are extremely rare events, even in the tornado belt of the midwest. National Weather Service records indicate that a tornado system of this strength had never before been experienced east of the Mississippi River. All of these tornadoes were generated by one super storm cell. This super cell was first detected on radar in Georgia and South Carolina on the afternoon of March 28. The cell continued to travel northeast at 40-50 miles per hour and first began to send tornadoes down in South Carolina. These tornadoes caused many different types of damage.

MICROWAVE TOWER

This microwave tower was destroyed. In fact, communications in general in the area of the storm were in a shambles.

AMATEUR RADIO #1

If it had not been for Amateur Radio we would have been in serious trouble. Amateur Radio provided an entire communications system that was absolutely essential to our emergency operations. It served in many different areas where we had completely lost communications. It also served to support our overloaded emergency communications systems. It provided communications links for all levels of government, federal, state and local. It was particularly important to us for administrative communications in that it relieved the primary systems for emergency operational use. However, it also carried much of the operational information necessary to control on-going operations. Amateur Radio provided direct communications systems to victims. It linked local governments with victims in shelters and other points. It also enabled the victims to communicate with friends and relatives outside of the disaster area. This proved to be particularly important for a number of days following the 28th of March. Often the first word that family and friends received from the disaster area came through Amateur Radio. For instance, in the town of Red Springs, which suffered an almost total loss of telephone service, Amateur Radio established 24-hour communications points at 14 locations around the town to provide emergency communications for police, fire and rescue services. This service was maintained for several days. On numerous occasions citizens requested and received all types of emergency service by calling for them through these 14 Amateur Radio communications points. Amateur Radio also linked up Red Cross with other relief agencies throughout the state and with local government. It also provided internal communications for a number of relief agencies to assist them in controlling their internal operations. Amateur Radio also provided communication assistance to the news media to aid them in coordinating their activities in the disaster areas. They also provided severe weather spotting, both before, during, and after the major tornadoes as we continued to have bad weather for a relatively long period of time.

AMATEUR RADIO #2

This slide will give you some idea of the scope of Amateur Radio operations in support of our emergency response. 350 operators were involved. They manned at least 20 sites 24 hours a day. Some of these sites were operated for up to nine days. We conservatively estimate that the Amateur Radio members drove approximately 50,000 mile in their private vehicles to provide this support.

SLIDES SHOWING DIFFERENT TYPES OF DAMAGE

No type of building or property was spared. Churches were damaged. Schools were damaged. This is the Flora McDonald school, a private school in Red Springs, a very beautiful old building on the Historical Register that suffered considerable damage. As you can see, some of these were very substantial buildings. Downtown areas were devastated. Industrial buildings and sites were destroyed or heavily damaged. Farm equipment and property was destroyed. Public schools were devastated. Have you ever seen a train load of bricks blown over? Of course, homes were destroyed. Cars were.

MOBILE HOME SLIDES

This was a house trailer. 38 percent of the people who died as a result of the storm lived in mobile homes. Mobile homes generally were almost completely destroyed when hit by a tornado, and very frequently death occurred in them because they were so completely destroyed.

HOUSE WITH WALLS

On the other hand, homes with only a few walls remaining, especially if the people had time to get under a table or in an inner hallway, tended to provide much more protection than was apparently available in mobile homes. At least in North Carolina on the 28th of March people in damaged houses tended to survive at a much higher rate than people in mobile homes.

TIMBER SLIDES

Thousands of acres of trees were destroyed. Many of the trees could not be salvaged for timber because the tornadoes subjected them to tremendous torque or twisting. When attempts are made to saw lumber from such trees, they tend to split.

SHELTER

A total 10 major shelters were opened. As you can see, the condition of homes made shelters necessary.

DONATIONS #1

All manner of donations began almost immediately to arrive in the disaster areas on every conceivable mode of transportation. You should be aware if you get involved in a major disaster that donations begin to arrive quickly. Before we finished, we had 22 warehouses that we used as distribution points. All were full of donated goods. It was from these 22 points that we distributed food, clothing and other goods to points where it was needed. In the first four days alone the National Guard moved four tons of donated clothing. This is just the amount of which we had knowledge. Local churches and other volunteer and civic groups from other cities and locations around the state shipped many tons of food and clothing to the disaster areas of which we had no knowledge or control in the first few days. These donations came from a number of states. To name just a few: Florida, Virginia, Illinois, New Jersey. How would you like to be handed a telephone at 12 midnight and have someone ask you what you wanted to do with two C130 loads of food and clothing that had just landed at a nearby airport? Offers of assistance came from many other states. All kinds of goods came from all kinds of points in hugh quantities. How about a tractor trailer load of diapers? One community received about 2,000 jogging suits. Actually this gift turned out to be very well received. Clothing was needed, and this type of clothing fitted a wide range of people. How about Easter baskets? It was close to Easter when the disaster occurred and we received 630 Easter baskets and they were all used. This was done by school children in North Carolina. One Holiday Inn under renovation offered all of its beds and furnishings from 100 rooms.

DONATIONS #2

This slide depicts other donations that were received. Many sizeable cash donations were given. Sheets, blankets, towels, undergarments, linens, jeans, shirts.

DAMAGE SLIDES

Nevertheless, these donated goods did not meet all of the needs of the people.

DECLARATION SLIDE

In all, 14 counties were declared eligible for individual assistance and 11 counties were declared eligible for public assistance.

DFO SLIDES

Seventeen Disaster Assistance Centers were established. Two of these were mobile DACs that were used to go into areas where there were only a few victims. Many people were helped in the Disaster Assistance Centers. 517 families from 1,300 applications were helped through the Temporary Housing Program. 262 were placed in mobile homes. Others were placed in other forms of temporary housing, such as FHA repossessed homes. 1,751 victims applied for Individual and Family Grants. The Small Business Administration received 1,248 applications for assistance. The State is administering a $400,000 State relief fund to meet all those needs unmet by the other programs. There were also 40 applications for public assistance from all types of public and private non-profit organizations. About $2 million has been approved thus far for public assistance.

PROBLEM AREAS

Donations: Be careful of what you ask for and when you ask for it. Initial requests for donations tended to be general in nature and it immediately became extremely difficult to match specific needs with donated resources. The best solution might have been that only money be donated. Such funds could then have been used to meet specific needs of victims. This is not to say that some other types of donations are not needed, prepared meals for instance. I am referring mainly to uncontrolled donations from the general public. Uncontrolled donations generated by a wide appeal for assistance was the root of our problems with donations. All types of volunteer agencies gathered donations and carried them directly to the stricken area. It became extremely difficult to identify those communities that still needed assistance. Some communities were oversupplied with donations and some were undersupplied. This was particularly acute in the area of food supplies. We lost control of the donated food supplies in the first few hours and it took days to regain it.

Inventory: Another problem was the inventory of goods. At first no inventory was made of donated goods as they arrived. For the most part, it was simply stored according to the type of good it was. Requests would come in in the first few hours or the first days or so for a specific need. We were in the position of only being able to deliver a truck load of generic donations. It cost the State thousands just to move the donations to distribution points. Distribution to the victims from these points was also a problem. Initially there was no means of identifying victims and their needs.

Volunteer labor and equipment was also donated and became a management problem. Volunteers often wanted to go directly to the affected area. Naturally the victims were wary of strangers in their midst. Our solution to this problem was to establish contact points for volunteer labor in each community. How did we respond to the other donation-generated problems? A committee consisting of representatives from the Division of Emergency Management, Department of Social Services, the National Guard, the Red Cross, the Salvation Army, and other service organizations was formed to coordinate volunteer activities and donations. I recommend very strongly that a committee of this type be formed as quickly as possible after the beginning or onset of an emergency or disaster.

Information Flow: One of our bigger problems involved the flow of information as it related to donations and volunteer activities. Probably the biggest difficulty was letting the general public know what was needed in the disaster area.

Damage Determination: The problem we had with damage determination related specifically to the type of emergency we experienced. Two things made damage determination a particularly difficult process. The tornadoes occurred over a path about 235-240 miles long and anywhere from 2 to 4 or 5 miles wide, or even wider Secondly, they occurred during the early evening hours just at the onset of darkness, so it was difficult to know exactly where the damage was. The tornadoes were up and down and they kept forming and dissipating. It is completely different from, say, a hurricane or a large chemical incident.

Communications: Once again, you cannot have enough communications. Without it one cannot collect information and the lack of information means that decisions are based on incomplete, out-of-date, or erroneous data. Management without communication is a little bit like trying to drive an automobile without headlights during the hours of darkness. As I have mentioned before, we used Amateur Radio to take up the load on our emergency communication systems and to replace those communications systems that were no longer available to the general public.

Siteseeing: Trying to keep the sightseers out. It gets difficult at time to distinguish them from true volunteers. They hamper on-going emergency operations.

Victim Location: In a system of tornadoes such as we experienced this is a real problem, particularly when such tornadoes occur in the evening hours. Again, our problem with this was increased by the loss of communications. Victims scattered along a path 235 miles long. In cases like this you must rely on local response.

After the emergency response phase, we entered into the recovery phase, and our problems continued. Federal disaster relief assistance caused many of the positive attitudes to change into negative feelings. Those programs are too slow, too fragmented, and worry more about the possibility of duplicating benefits than serving the victims. This is not to say that the Federal employees administering these programs were at fault--they were not. They work long and hard. The law and regulations governing this disaster relief assistance need a very close look.

POSITIVE ELEMENTS

Now I would like to say a few words about positive elements of the response to the emergency. Most of the positive elements I have already touched on earlier. One thing that we did that worked particularly well was to use local coordinators from areas not affected by the emergency to reinforce their counterparts in stricken counties. This assured that someone was in the county Emergency Operating Centers that understood emergency response. This not only helped the stricken county, but it provided invaluable training to those people who came in to help. I have already mentioned our State Emergency Response Team concept. At times during this emergency there were several thousand people involved in the response and the concept workedwell. Volunteer response from all organizations, agencies, and also from the general public was good. However, we need to learn to channel it better and to develop those channels quickly in an emergency. Amateur Radio as I mentioned saved the day for us. One thing that I have not mentioned yet - our major emergency response exercises. In the past few years we have conducted a number of major exercises. Many of which were concerned with nuclear plants, but some were not. These exercises prepared our Division and other state agencies to work together to enable us to fine tune our basic plans and procedures. Consequently, the management of this emergency response was almost routine in that we followed the plans and procedures that we had previously exercised.

SPECIFIC COMMENTS

I hope that this slide presentation has given you a better understanding of the impact of the storms on North Carolina and a feel for the cooperative effort that is necessary to cope with such emergencies. In the slide presentation I mentioned the State Emergency Response Team. The National Weather Service, even though it is a not a State agency, is an integral part of that team, during both weather related emergencies and those technologically related. For example, the existing and forecast weather conditions play a major factor in mitigating the efforts of a large scale hazardous material spill or an accident at a nuclear power plant. We are very fortunate in North Carolina to have a fine and cooperative weather service staff. Without this cooperation the State of North Carolina and the citizens would have, no doubt, suffered a great deal more during the recent disasters which have struck our State.

For example, the State of North Carolina with the help of the National Weather Service has just recently updated its hurricane procedures and is embarking on an even more comprehensive and detailed study of hurricane evacuation. A few weeks prior to Hurricane Diana Joe Pellesier of the weather service staff and members of the Division of Emergency Management conducted workshops in which elected officials and key emergency personnel from each of the coastal counties "walked through" hurricane operations using the new plan and a scenario developed by the weather service. The effectiveness of this type of exercise is evident. When Hurricane Diana came ashore, evacuation plans and procedures went smoothly and no loss of life was experienced on our coast. This type of preparedness effort needs to be expanded. North Carolina needs a warning/preparedness meteorologist who could devote full time in assisting in these preparedness efforts.

I understand that the staffing shortages which have long plagued the operations at Raleigh-Durham are now being alleviated. However, no matter how well we staff these offices, unless we provide these meteorologists the most current equipment, the services they deliver will be less than optimal. The five centimeter radar currently being used at Raleigh-Durham is effective for use only in local warnings. The population and area that the Raleigh-Durham office serves warrants upgrading to a larger, more powerful system. A ten centimeter system with the appropriate staff would increase the effective range to 125-150 miles. Even with this enhancement, the weather service should continue its efforts to procure Doppler Radar. In the slide presentation you saw the microwave tower that was destroyed. A redundant communication system must be developed.

No matter how sophisticated, advanced, and accurate our forecasting mechanisms may be, unless we are able to convey this warning to the public, our efforts will be in vain. The backbone of this system and its weakest link is the Emergency Broadcast System. The Emergency Broadcast System exists only as a result of voluntary compliance by the broadcast media. There is little or no federal support for this system. In fact, the Federal Communication Commission is proposing to completely wash their hands of EBS. If this becomes a reality, there will be no way to adequately warn the citizens of impending danger. I should add that the move by the FCC to divest themselves of the Emergency Broadcast System is not supported by the broadcast industry. They realize as I do that the regulatory authority exercised by the FCC in other broadcast areas implies some authority on EBS. The Federal Emergency Management Agency is posturing itself to take over this system. This agency, while it does provide some funding for hardening transmitter sites, has little comprehension of the EBS problems. For your information and background I have attached to these comments letters between our agency and the Federal Emergency Management Agency regarding the Emergency Broadcast System.

In summary, the National Weather Service should be commended for their fine cooperative efforts. They should, however, be provided manpower and equipment to make these preparedness and warning efforts even more effective. The Emergency Broadcast System, the key to this warning system, should be strengthened. Participation should be mandated by the FCC. FEMA funding of the Emergency Broadcast System should be shifted from the hardening aspects and additional funding be provided to allow states to work more closely with broadcast media and to provide auxiliary power.

In closing I once again appreciate the opportunity to address this Subcommittee and would be pleased to answer any questions.

North Carolina Department of
Crime Control
& Public Safety
116 West Jones Street Raleigh 27611

James B. Hunt, Jr., Governor
Heman R. Clark, Secretary

Division of Emergency Management
(919) 733-3867

July 27, 1983

Mr. Louis O. Giuffrida, Director
Federal Emergency Management Agency
Washington, DC 20472

Dear Mr. Giuffrida:

Communications is key to the success of any emergency response system. Because of this commonly accepted fact, during the last several years much effort has been devoted to improving emergency communication systems that service the various levels of government. The FEMA sponsored Emergency Operations Center program, which usually includes upgraded communication facilities, is a good example of the general effort to improve emergency communications.

With the advent of the integrated emergency management concept, emergency communication systems will be subjected to different requirements. Generally, a faster emergency response time will be essential if the public is to be protected from threats such as floods, tornadoes, nuclear incidents, fires, and traffic accidents involving toxic chemicals. Only quick, reliable emergency communication systems will enable government to effectively respond to rapidly occurring emergencies.

Presently, however, there is a major flaw in this country's emergency communication system between government and the general population. The last and most important communication link -- the Emergency Broadcast System (EBS) -- has been virtually ignored for years. It is the only means government has to transmit urgently needed real-time information to the public. Unfortunately, EBS is almost non-existent. A cursory examination of recent FEMA budgets will show that EBS has received very little program emphasis and advantage has not been taken of technological advances.

The current status of the system makes it a candidate for failure, especially in those situations requiring a rapid response to protect lives and property. Such situations will occur with greater and greater frequency as FEMA and the remainder of the emergency response community moves into the operational mode dictated by the integrated emergency management concept. Even a superficial examination of the current EBS system raises many questions:

- Should participation be mandatory or voluntary?

- Should broadcast stations be required to participate in system tests? If so, how frequently?

Attachment 1

- Should operational area primary stations monitor both the Common Program Control Station 1 (CPCS-1) and the Common Program Control Station 2 (CPCS-2)?

- How can formats be changed to reduce broadcast station response time? (North Carolina has already done considerable work in this area.)

- How can the system be protected from activation by terrorists?

- How should automated systems participate?

- In addition to broadcast main carriers, should FCC procedures apply to sub-carriers, travelers' information services, companies that provide music (i.e., Muzak) and other similar services to business and industry, cable television, broadcast distribution services, and other information and entertainment transmissions designated for reception by any part of the general public, business, or government?

- Should the National Oceanic and Atmospheric Administration radio system be automatically included in EBS?

- Considering the present system and current technology, what technical approach should be used to insure economy, provide required operational capabilities, and the ability to adapt to rapidly changing requirements and technology?

- How can interstate or regional use of EBS be improved?

- How can the system be promoted?

These, of course, are only a few of the questions that need to be addressed.

I propose that the North Carolina Division of Emergency Management be funded by FEMA to study EBS, establish an improved prototype system in North Carolina, and develop guidance to enable other states to improve their systems. North Carolina is in a unique position to accomplish these tasks. In addition to having been a leader in the implementation of the comprehensive or integrated emergency management concept, we have an employee who is both an excellent and experienced radio engineer. and who is well known by many of the broadcasters in this State. In other words, we have both the operational and technical experience as well as the contacts in the State's broadcast industry. In addition, the Chairman of the N. C. Association of Broadcasters Emergency Broadcast Committee supports this project and promises his cooperation. These factors combine to give us an excellent opportunity to improve a communication system vital to the Nation.

Our approach would be a practical one designed to take advantage of both the existing system and the latest technology. Basically, a phased approach encompassing broadcaster coordination and FEMA approval after the end of each phase seems to offer FEMA the control it would need to manage the project, a means to insure broadcaster participation, and this Division the flexibility it would need to get the job done. Preliminary thinking suggests that an approach similar to the one below would be acceptable to both FEMA and North Carolina.

Phase 1: Project Design

Identify problems
Develop schedules
Develop projections
Develop a plan of work
Develop budget estimates
Review literature and existing systems
Coordinate with N. C. Association of Broadcasters
Obtian FEMA approval

Phase 2: Prototype System Improvement Plan

Federal government use of state system
State government use of state system
Local government use of state system
Regional use of state system
Hardware proposals
Procedures
State promotion plan
Regulatory change recommendations
Procedure recommendation
System redundancy
Coordinate with Broadcast Association
Obtain FEMA approval

Phase 3: Equip and Test N. C. System

Equip and test state system
Test federal use of system
Test state use of system
Test local use of system
Test general system effectiveness
Modify system as required
Coordinate with Broadcast Association
Obtain FEMA approval

Phase 4: Produce an EBS Development Guide for Use by Government

Public guidance including:

- Methodology to update the EBS
- Methodology to promote EBS

Coordinate with Broadcast Association
Obtain FEMA approval

Preliminary estimates indicate that this project would take approximately two to three years. Further, we would welcome the opportunity to coordinate this project with any related ongoing or new studies at the national level.

I urge you to seriously consider this proposal and take advantage of this unique opportunity to improve this nation's Emergency Broadcast System. I and members of my staff and the Chairman of the N. C. EBS Committee would appreciate the opportunity to discuss this proposal with you at your earliest opportunity. If you are interested, it would be advantageous to announce the project at the annual meeting of the N. C. Association of Broadcasters this fall. The Chairman of the N. C. Emergency Broadcast Committee has proposed that the project be introduced at that time. This means, of course, that action to set the project in motion should be taken soon if we are to take advantage of this opportunity to promote the proposed study.

Sincerely,

Jesse T. Pugh, III

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Federal Emergency Management Agency
Washington, D.C. 20472

Mr. Jesse T. Pugh, III
North Carolina Department of
Crime Control and Public Safety
P.O. Box 27687
Raleigh, N.C. 27611

Dear Mr. Pugh:

This is in response to your July 27, 1983, letter concerning your proposal to develop a prototype Emergency Broadcast System (EBS).

I appreciate your interest in the EBS and agree with you as to the importance of the system to the States and localities. I agree that the EBS is generally the best means of providing warning and emergency information to the public.

I do not agree with your statement that the EBS is non-existent. Several States have completed their planning and are beginning to test their systems. Wisconsin, as an example, has been testing their system for at least two years and is in the process of developing County EBS plans in addition to their local operational areas plans. Approximately 410 of 574 local operational areas have completed plans and 32 State plans are finalized. In many parts of the country, the systems are and have been used extensively and effectively as evidenced by the numerous reports and activations of the system.

I do not mean to imply that our work in EBS is near completion. We in the Federal Emergency Management Agency (FEMA) intend to place even greater emphasis on the system in the future. For the first time, funds were made available to 10 States to assist in the development and conduct of tests of their EBS plans and systems. FEMA's objective is to complete all plans by the end of 1984 as well as improving the quality of existing plans.

You proposed that FEMA provide you with funds for a study of the EBS, for you to establish an improved prototype system, and to develop guidance for use by other States. Further, you indicated this to be a two or three year effort.

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Attachment 2

I feel I can not justify funding a prototype system considering many States have had their systems in existence for considerable time. Plus, other States are presently working on their systems.

We are, however, impressed with many of the other points in your letter which if pursued could be of assistance to us. On these issues, I propose that a member of your staff contact Mr. Jim Gilbertson (202-287-3886) should you wish to pursue the matter, subject to the above conditions. I am sure he will be responsive.

If I can be of further assistance, please do not hesitate to contact me.

Sincerely,

Dave McLoughlin

Dave McLoughlin
Deputy Associate Director
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and Support

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James B. Hunt, Jr., Governor
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Division of Emergency Management
(919) 733-3867

November 21, 1983

Mr. Louis O. Giuffrida, Director
Federal Emergency Management Agency
Washington, DC 20472

Dear Mr. Giuffrida:

Although I was extremely disappointed with your August 19, 1983, response to my proposal to improve the Emergency Broadcast System (EBS), I was pleased to read that you agree as to the importance of the system to governments at all levels. Also, I would like to correct an impression you evidently gained from my proposal. I did not say that EBS was non-existent; I did claim the system is almost non-existent.

I was also pleased to read in Federal Emergency Management News Release number 83-100 dated October 17, 1983, that you have apparently reconsidered the stand you took in your rejection of our earlier proposal and that you are pursuing one of the actions we suggested on July 27, 1983. I am referring, of course, to your award of a $200,000 contract to a firm in California to investigate the feasibility of extending EBS to cable. Since we already have such a system working, we could probably have saved you some of the expense of doing this particular feasibility study. We will be glad to consult with your contractor. I am sure that we can save him time and money.

I am still concerned about the lack of a systematic effort to improve EBS. I realize that it is difficult at the federal level to obtain a true picture of the situation at the State and local level because you are forced to rely almost entirely on statistics. We checked with several other states and found that, without exception, the emergency management offices expressed major concerns regarding EBS in their states. This gives reason to question the accuracy and operability of the plans to which you referred in your letter. One state from whom you have received a completed plan was candid enough to say that their EBS was a shambles, and that they only worked on EBS in operational areas with a nuclear plant.

North Carolina has made a strong effort to improve our EBS, but our efforts have been hampered by the current status of the overall program. North Carolina also has a nearly completed state plan and is involved in the routine testing procedure. I wish that I could report a major success. For instance, in

Attachment 3

one operational area 15 percent of the stations were found to be monitoring the incorrect CPCS-1. In another operational area two stations could not even receive another North Carolina broadcast station. In still another operational area we found that the appointed CPCS-1 could not monitor the adjacent operational area CPCS-1 to establish the primary relay network due to adjacent channel interference. These things you do not find out until you personally survey the stations. All are typical of the situations fostered by lack of strong federal guidance, minimal federal budget emphasis, and use of outdated technology.

The fact is that current EBS plans at FEMA and elsewhere are based on vintage 1950s civil defense concepts. FEMA still continues to spend excessive dollars to harden stations from nuclear attack when auxiliary power units for CPCS-1s are desperately needed. In addition to auxiliary power, system redundancy is needed. North Carolina has a fairly good complement of CPCS-1s, but needs a complete complement of CPCS-2s with cross monitoring between adjacent operational areas and dual monitoring by primary stations within operational areas. Such operation, although essential for safety, is not required by the FCC, and very few stations will spend the cash to provide the desired monitoring. New technology, announced within the last six months, could provide multiple monitoring at very little more cost than now paid for single monitoring.

In any case, I support your changed stance on EBS and encourage you to continue your new efforts to improve the program. Finally, I want to offer once again any help that we can provide.

Sincerely,

Jesse T. Pugh, III

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Mr. VALENTINE. Thank you very much, Mr. Pugh.

Mr. Ellis Stanley, director of the Durham Emergency Management Agency. Mr. Stanley, we are delighted to have you here with us on this panel.

Mr. STANLEY. Thank you, Congressman Valentine. Again, as my other colleagues have indicated, and as a local professional emergency planner, I would like to commend you and your committee for having such a forum that these things can be aired. I think it adds greatly to the mitigation efforts that would come about from this.

If you will allow me, sir, I will only comment from my notes and not reread all of my comments to you in the interest of time.

When we look at our local efforts to mitigate damages and loss of life from severe storms, we look at education as being one of the key factors. Education is the key to make our citizens aware that the best protection from a tornado are early warning and adequate shelter. We work with our local cablevision companies, emergency broadcast systems, as well as directly with many radio and other media sources to educate and make citizens aware of potential dangers associated with severe storms.

One of the problems that impinge upon the ideal cycle of day-to-day interaction was explained in the survey reviewing the Weather Service's capabilities. There is a lack of staff to constantly reinforce the preparedness efforts within the community. And to point to an example, we have been trying to get spotting services, spotting programs, in Durham, and we have had excellent participation with the Raleigh office of the National Weather Service. However, their schedules, their time and their staff really has prevented us to actually get these programs off the ground.

There appears to be success within the school systems to a degree, in that they do occasionally exercise. However, it is quite different to get government officials and agencies to incorporate into their annual program the need to exercise and test their capabilities to respond and be prepared to cope with disasters.

I stop not only at local jurisdictions but at the needed interaction that results through mutual aid. Many agencies do not have contact with others until the "big one" occurs, and many times this is far too late. Local industrial mutual aid agreements are not to be overlooked, either, because many of our citizens are working in these facilities and it is very important that they are equally informed of impending dangers.

When we discuss the performance of the National Weather Service during the storms in North Carolina and consider the circumstances, I believe they performed admirably.

We all have opinions of improving certain conditions. Mine deals with the established alerting procedures that take place. For tornadoes, you have the watch and the warning. The watch, meaning potential exists for a tornado. Maybe further instructions should be given that would require local officials to come together in a readiness phase to be better prepared to respond and tie the many sirens that exist within the communities into the system at this stage, using them only as attention getters that would lead to the Emergency Broadcast System, cablealerts, et cetera, for earlier notifications.

I further reemphasize the comments that Andy Park made and that the alerting procedures are really confusing, and that to declare a tornado warning means that a tornado has already hit. In smaller areas it is really too late because you are actually suffering the destruction and the public is looking for some other signs that they have time to take cover. In fact, that is not the cast.

Second, realizing the need for authenticity of various siting, some latitude may be needed in accepting destruction reports when citizens did not actually witness the tornado.

For example, a small tornado that caused $800,000 worth of damage in Durham was not actually confirmed until the following day.

Communications usually is a standard when looking retroactively at any issue. Disaster response is no exception. Amateurs—these are amateur radio operations, ham operators—are able to talk literally around the world. It's ironic that other agencies cannot communicate across the State, nor have the necessary backup capabilities to maintain operations.

This observation is not meant to castigate any agency; merely to point out that we rely on these amateurs so heavily during the actual emergency that we should utilize them more in nonemergency situations to make for smoother operations, either in informing us how local governments can utilize a system that they have to maintain and backup operations.

The storms that affected North Carolina were somewhat of a blessing in disguise as related to the overall emergency management program in that much coordination that does not take place on a day-to-day basis was forced upon many agencies. This coordination and cooperation between local, State and Federal officials during the presence of severe storm outbreaks should simply be a continuation of the day-to-day efforts to save lives and protect property by developing programs and emergency operation capabilities that mitigate, prepare for, respond to, and recover from any emergency or disaster.

Again, I would like to thank you and your committee for allowing such a forum to take place. Thank you.

[The prepared statement of Ellis Stanley follows:]

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Ellis M. Stanley, Sr.
Director/Coordinator

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Throughout the U.S., county and municipal officials are looking to their "Civil Defense people" to prepare the plans, provide the equipment and supplies, coordinate the training, and even handle the staffing to handle major emergencies. They seem to view "disasters" as something different from everything else addressed by local officials. They consider "disaster plans" to be these mysterious notebooks that gather dust on the shelf...not needed at all until the "big one" comes. When something "big" does happen, they either ignore the specialists who can help them or castigate them for not having all the answers and resources immediately.

I mention this only to show that much of an Emergency Coordinator's time should be spent in education. Educating local government appointed officials such as police chiefs, fire chiefs, etc. and others holding department head positions. Each of them has a role to play; they need to learn what their role is and how it differs from the other as well as how it impacts on the public.

Member of United States Civil Defense Council

As we approach local efforts to deal with the hazard potentials that face each of our communities, it is important to understand that disasters don't just suddenly appear. A hazard exists, but it takes some event or accident to turn it into a disaster. Because of this, one of the basic principles of Comprehensive Emergency Management is that we can do something useful both before and after a hazard strikes.

Being prepared is only one phase of Comprehensive Emergency Management. A community also has the opportunity to deal with emergencies before they strike and the responsibility to aid recovery after a disaster. As a result, we define four (4) phases of Comprehensive Emergency Management. They are: mitigation, preparedness, response, and recovery.

These phases are visualized as having a circular relationship to each other. Each phase results from the previous one and establishes the requirements of the next one. Activities in one phase may overlap those in the previous phase. For example, preparedness moves swiftly into response when disaster strikes. Response yields to recovery at different times depending on the extent and kind of damage. Similarly, recovery should trigger mitigation, motivating attempts to prevent or reduce the potential of a next disaster.

Finally, the disaster phases know no beginning or end. The recognition of a threat can motivate mitigation as well as an actual emergency.

What then are our local efforts to mitigate damages and loss of life from severe storms.

Again, education is the key to make our citizens aware that the best protection from a tornado are early warning and adequate shelter. We work with our local Cablevision companies, Emergency Broadcast Systems (EBS), as well as directly with many radio and other media sources to educate/make citizens aware of potential dangers associated with severe storms. One of the problems that impinge upon the ideal cycle of day-to-day interaction was explained in a survey reviewing the weather service's capabilities. That is the lack of staff to constantly reinforce the preparedness efforts within the communities.

There appears to be success within the school systems, to a degree, in that they occasionally exercise. However, it's quite different to get government officials and agencies to incorporate into annual programs the need to exercise and test their capabilities to respond and be prepared to cope with disasters.

I stop not only at local jurisdictions but at the needed interaction that results through mutual aid. Many agencies do not have contact with others until the "big one" occur and many times this is far too late. Local industrial mutual aid agreements are not to be over looked either because many of our citizens are working at these facilities, and it's very important that they are equally informed of impending dangers.

When we discuss the performance of the National Weather Service (NWS) during the storms in North Carolina and consider the circumstances, I believe they performed admirable.

We all have opinions of improving certain situations. Mine deal with the established altering procedures that take place. For tornados, you have the Watch and the Warning. The Watch, meaning potential exist for a tornado. Maybe further instructions should be given that would require local officials to come together in a readiness phase to be better prepared to respond and tie the many sirens that exist within the communities into the system at this stage; using them only as attention getters that would lead to the EBS, CableAlerts, etc. for earlier notifications.

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This observation is not meant to castigate any agency; merely to point out that we rely on these amateurs so heavily during the actual emergency that we should utilize them more in non-emergency situations to make for smoother operations.

The storms that affected North Carolina were somewhat of a blessing in disguise as related to the overall Emergency Management Program in that much coordination that does not take place on a day-to-day basis was forced upon many agencies.

This coordination and cooperation between local, State, and Federal officials during the presence of severe weather outbreaks should simply be a continuation of the day-to-day efforts to save lives and protect property by developing programs and emergency operational capabilities that mitigate, prepare for, respond to, and recover from any emergency or disaster.

EMS/bj

Mr. VALENTINE. Thank you very much, Mr. Stanley, and all members of this panel for your participation in this hearing and for the preparation and, indeed, what you did and all were responsible for in connection with the effort that was so roundly praised, as you recall, by earlier testimony in connection with the survey that was made after the tragedy.

I would like to ask a few general questions and give you an opportunity, I think, maybe to stress or underscore some things that you have previously mentioned, because, you know, our function—and I appreciate what somebody, I believe Mr. Pugh, has said about the—what has been accomplished already. I think based on the disclosure made here today, I think that this and other hearings of this kind have already had a substantial impact. But the questions should give you an opportunity to say again, perhaps in a different way, what is it that the Federal Government, the Weather Service, didn't do that it should have done, for whatever reason, whether it's the results of the shortness of personnel or money, equipment, or whatever, and what did they do that they shouldn't have done. In other words, how can we improve the situation?

I might say parenthetically, that some of the media folks who came running up here after the noon recess, you know, asked questions of me as if to say, who are you here to indict? Who are you here to point the finger at? And I had to spend a lot of time trying to say to those folks who did, that's not the purpose for this hearing at all. There's much more good in the Weather Service and the effort that the Federal Government makes to let the citizens of this Republic know what is in store for them from nature than there is bad. But, you know, we would be in a poor state of affairs when you get to the place we don't have a thing we can improve.

So, with that in mind, let me ask you, maybe, Mr. Pugh, this is a question—under—talking about this national warning system, what are the present arrangements for the use of that system in North Carolina during—at the present time, during severe storm emergencies?

Mr. PUGH. Well, the national warning system originally was developed as a defense warning system for attack. We have less than adequate coverage—I mean by coverage, less than one telephone per county in the State of North Carolina. Through the years there had been some fanout mechanism for the warning to come from the State or the Weather Service down to a county——

Mr. VALENTINE. Let me interrupt you a minute. You are too young to know this unless somebody told you, but just to go to the tact—to the system that was developed for civilian defense during World War II when they had these lookout towers all around in these little towns, you would go up—the citizens would sit up there all day looking for airplanes.

Mr. PUGH. The national warning system that I understand, Mr. Valentine, is just like a big party line telephone system.

Mr. VALENTINE. Yeah.

Mr. PUGH. And doesn't really tie into spotter networks, and this type of thing. It ties in from, as a national system, it ties in with all 50 States; and within each State there's another party line that goes from there. It does not cross the State lines. Therefore, the Weather Service in South Carolina, it's my understanding based on the study, cannot talk to the Weather Service in North Carolina. But there's less than one—there's not a telephone in each—in each county warning point. So even if you were getting on this system and to pick up the telephone and talk, you would be getting less than complete coverage at that time.

Mr. VALENTINE. So what you are saying, it really isn't much of a system?

Mr. PUGH. It's not, it's antiquated.

Mr. VALENTINE. Do you think that if it had the potential that was envisioned for it, that it would—is it feasible to think of it as not only a system whereby information about storms can be passed out to the public, but for—but as a gathering of information?

Mr. PUGH. I think it's used that way on a small scale, and used rather effectively—still thinking it's—it's not a state of the art. Certainly technologically speaking, it's in the horse and buggy age. It needs to be expanded. I know the Federal Emergency Management Agency, which is in, I believe, in control of that system, are not funding any more drops. As a matter of fact, they are not even funding support for those—any more telephone systems.

Mr. VALENTINE. Mr. Stanley and Mr. Brantley, what do you in your respective communities, in Rocky Mount and in Durham, what use do you really make of this NOAA radio—weather radio system? I mean by that, is that—is that part of the county or city communications system? Is somebody that monitors that all of the time, or is it such—go ahead.

Mr. BRANTLEY. Ours, which is in the National County Emergency Operations Center, is approximately 3 feet from two dispatchers. Any indication through the PIN terminal of early severe weather, which as stated before, I think the PIN terminal is—is something that cannot be used as a severe weather alert, especially during a storm, because the PIN terminal is more or less turned off to prevent damage. So that certainly wouldn't be a good warning.

But the NOAA weather wire is in the EOC in Nashville, and it is used by those dispatchers. They depend on that—that piece of equipment. It may be outdated, it's an old machine, it's a teletype printout type thing. But it is one way that they determine severe weather.

So I feel like that it's—it's good to have there. I don't know if it's the most efficient way or not, but it's good to have there.

Mr. VALENTINE. Well, all we're talking about the—you're talking about the wire or the radio? There is——

Mr. BRANTLEY. Yes, sir, there's the radio. Now, did you address the radio or the wire?

Mr. VALENTINE. The radio.

Mr. BRANTLEY. Oh, excuse me.

Mr. VALENTINE. Both, really, but I was especially interested in the radio.

Mr. BRANTLEY. The radio is—that's one thing that I have in my office that I listen to and monitor constantly when we have—keep it on alert right there. I feel like it's good, sometime my signal breaks up, but I don't usually have any problem monitoring that—that radio channel, and it normally gives good information. I monitored it the entire time during Diana.

Now, whether it reaches everybody or not, I don't know. A lot of times the update is what I think is a little bit slow, sometime. You may have a 4 o'clock update or something like that.

Mr. VALENTINE. You keep that thing on all the time?

Mr. BRANTLEY. I keep it on alert. And you can just keep it on alert, when they activate the tone, then it will come on.

Mr. VALENTINE. I see.

Mr. BRANTLEY. They test it every Wednesday morning at approximately 11 o'clock, because my—the people that work with me fuss at me for that thing coming on when I'm not there.

Mr. VALENTINE. I was going to say, if you had that weather thing and broadcasting—I can envision something broadcasting continuous weather. If that thing was running all the time, if I were you, I'd have a lot of work to do outside of my office.

Mr. BRANTLEY. Yes, sir. [Laughter.]

It goes constantly but you can set it on the alert and when they activate some type of tone, I guess, that's when it will come on. But I do monitor it and I think it gives adequate information. But like I say, sometimes the information seems to be a little slow getting there.

Ellis may feel——

Mr. STANLEY. In Durham, sir, I think that NOAA radio is a very good tool for the citizens. We highly encourage it in our nursing homes and our schools, and our shopping malls, senior citizens centers, any public facility, we praise the NOAA weather radio, because there is a constant source of information.

However, from a management point of view, I would prefer to see a dedicated telephone line going into the Raleigh office, and also tied in with the TV and the radio stations to enhance the EBS and have a constant update from the horse's mouth, so to speak, that we can speak directly to them and get updates as they occur.

There is a use for the current NOAA radio and I think it's a good use. But for the—from the operational standpoint, if we could somehow get some type of dedicated line coming in from these services, I think it would be very good.

Mr. VALENTINE. A dedicated line and some dedicated employees, and more of them.

Mr. STANLEY. That's right.

Mr. VALENTINE. That would help then, and some better equipment.

How do you get—how do you really get word of mouth about major weather changes, or wouldn't it be a fair—would it be a fair statement to say when you come right down to it, to what you hear on commercial television or radio is about as reliable as anything?

Mr. STANLEY. Well, fortunately, we do have unlisted numbers, I guess, into the Weather Service, and we can call in when those lines aren't tied up. I do rely on what I hear on the TV. I think we have some good weather announcers, meteorologists, on the TV, and they have a direct line into information. The amateur, as I mentioned earlier, we have the capability of going right into Florida or other places to get up-to-date information. But in working and knowing what we have available, I think we get some very reliable information off the radio when we can't get directly into the National Weather Service.

Mr. VALENTINE. When you, all of you, when you have an occasion to contact and deal with the National Weather Service, the officials, do you feel that you are fairly and courteously dealt with or treated?

Mr. STANLEY. I have no problems. We have done various programs in our schools, we do a lot of programs in our schools. And there's been times that they can't participate, and I do not think it's a put off, I think it's a legitimate conflict of scheduling and certain things as we—a lot of times we do not have a lot of leadtime. But very good support from them.

Mr. VALENTINE. How about you?

Mr. PUGH. Excellent support. I think as was mentioned this morning by some of the broadcast media, that they have been more than patient with them—the Weather Service has been more than patient with my office on many times, because I know we are one of a multitude of agencies trying to get information from them. And I think that they've got the patience of Job, I don't see how they do it.

Mr. VALENTINE. Thank you all very, very much, and excuse me just 1 minute. I might come back with something else.

I'm going to do something now that I think is a little bit unusual, and I don't want to get into any repetition, but if there's anybody else here who has anything that they would like to say for the record, or off the record, to this committee, I welcome you to come forward.

Yes, sir? You just have a seat right there and just talk into that microphone and state your name, rank, and serial number for the record, please.

STATEMENT OF DEAN CARSON, SENIOR ELECTRONICS TECHNICIAN, WEATHER SERVICE, RALEIGH, NC

Mr. CARSON. My name is Dean Carson. I am here as a citizen and employee of the Weather Service. I am the senior electronics technician at the Raleigh Office.

And some of the things that I believe needs to be addressed is everyone talks about these towers that are susceptible to tornadoes and things of that nature, and no one has suggested any possibility of satellite communications. This is a very efficient way of handling large volumes of—of communications, and this needs to be addressed by the Weather Service and be funded for it and put into operation. There are some plans that are intact now to put this into operation much later. But these plans that are on the back burner need to be pushed up and brought into the scope of this Doppler radar, you know, it should be in place as well.

I don't care how much Doppler radar that you have or anything of that nature, but if you don't have an effective communications from those offices and disseminated out to the public, then you will never have a good system.

The telephone lines and things of that nature today are becoming deplorable. We are having troubles in trying to keep communications on a day-to-day basis. The deregulation of the phone companies in dealing with the individuals, either AT&T or Bell System, and the conflicts that we are getting into coming back and forth on a technician level are becoming insurmountable. We are having phone calls that are asking us about the phone lines that we have no records of. Their recordkeeping is going way out in left field somewhere and you cannot get support. And that's why I wanted to come forth and say some of these things. And that the Weather Service is—and the—the offices in Washington are throwing down more and more pieces of electronics equipment that are coming in—and we talk about the meteorology staff. Well, I am telling you that the electronics staff in—in the overall plan of the Weather Service is just as important as the meteorology staff, and becoming more and more important every day.

And we need to address some of these problems in the electronics field. We need to have people that—that understand that you can't have a Weather Service if you don't have electronics to go with it. Technology is out there, and it's available. We need to have someone up in Washington looking out and seeing what is going on, what is happening in the—in the realm of what is available to the Weather Service.

I know that there's a lot of funding problems, a lot of things of that nature that are out of anyone's control. But if no one brings this to light, no one brings any viewpoints from out in the dark somewhere, then it won't happen.

That's all I have to say.

Mr. VALENTINE. Well, I appreciate it very much, and I am delighted that I—that I issued that invitation. I would—I think that is a point that is very, very well taken. I can just see the frustration just seeping from your pores. [Laughter.]

And I tell you what you do, you—I'm not the biggest rat in this barn by any means, but you write to me. I don't want to add to your burden, but you let me have in writing, if you would—and this will be all part of the record—as soon as you can, the highlights of what you have said here, and we'll see if we can't either get it done or find out why not. It seems to me that you have probably made the greatest contribution to this hearing of anybody here.

Mr. CARSON. Well, thank you, sir.

Mr. VALENTINE. And I am encouraged to say, anybody else?

Mr. PARK. Perhaps the chairman will forgive me, but I understand if I identify with him as perhaps we are from an era of wooden ships and iron men, but I, too, want to vigorously go on record of what Mr. Carson said—the technology is there. Mr. Chairman, your children and my children know how to operate it, the equipment is there. While they are still spending 11 years to get the next Doppler onstream, the Japanese are making it and selling it at Radio Shack, while Mr. Tealer is trying to figure out how to get all these phone lines together, I wear a beeper so somebody can reach me.

Mr. VALENTINE. And while we provide for their national defense?

Mr. PARK. That is correct.

Mr. VALENTINE. Just think what we could do in this country if we had someone with an umbrella of defense over us.

Mr. PARK. I just wanted to support what he said and to encourage you, sir, and your committee, to use whatever rat-killing facilities you have to encourage the people that hold the pursestrings and the technology strings to look ahead and not look backward. And thank you for the repeat.

Mr. VALENTINE. Thank you very much.

And there's somebody else down there raising—come on up, sir, if you will.

STATEMENT OF KERMIT KEETER, METEOROLOGIST, NATIONAL WEATHER SERVICE EMPLOYEES ORGANIZATION

Mr. KEETER. Congressman Valentine, I decided to come forward because I think maybe you recognize me from a previous meeting that we had about 1½ years ago.

My name is Kermit Keeter.

Mr. VALENTINE. Yes.

Mr. KEETER. I'm a meteorologist with the National Weather Service Forecast Office in Raleigh.

Mr. VALENTINE. Good to see you.

Mr. KEETER. Good to see you. And what I'm about to say cannot be construed as representing any official viewpoint of the National Weather Service. In fact, I come forth under the protective umbrella of the National Weather Service Employees Organization.

And the first thing I want to say is that I want to go on record and say that i applaud the fact that we've had this hearing. I think that——

Mr. VALENTINE. Excuse me, would you say again?

Mr. KEETER. I say I applaud the fact that we've had this hearing. I think that it may be the major impetus, or certainly part of the impetus, that was involved in resulting in the announcement that we will get a disaster preparedness meteorologist at Raleigh which we severely need.

I wish to maybe broaden the discussion just a bit for your consideration as you talk with your colleagues back on Capitol Hill. And essentially, if you remember in our discussion about 1½ years ago, myself and two other meteorologists visited your office.

Mr. VALENTINE. In Durham; yes, I know.

Mr. KEETER. In Durham. At that time, we were concerned about the administration, through NOAA, attempting to decrease the number of meteorologists, not only at the Raleigh-Durham Forecast Office, but at Forecast Offices across the Nation. In fact, we've spent the past 2 years maintaining a battle of sorts to try to ensure that we could just maintain current staffing levels.

I find it ironic that we are now adding one when only 1 year ago we were fighting like—like soldiers just to keep what we had.

In particular, the problem seems to be focusing on this: Congress is allocating moneys to restore funding for specific programs and services in the Weather Service and for what is considered to be sufficient staff. But at the same time, the National Weather Service is unable to fill those vacancies.

I think when the distinguished Congressman from New York asked the pointed question how many vacancies is the National Weather Service carrying now, it wasn't completely answered. The answer was just given in terms of weather disaster preparedness meteorologists. I am not sure what the number is but I do know that the Weather Service, in an attempt to meet its deficit budget problems, are holding vacancies. There's offices across the Nation such as Columbia, which up until just a couple of months ago, was carrying two vacancies.

Mr. VALENTINE. South Carolina?

Mr. KEETER. Right. Columbia, South Carolina.

The problem is widespread. There are a large number of vacancies occurring right now in the ranks of professional meteorologists, meteorological technicians and electronic technicians in the National Weather Service.

The problem seems to focus around something that's referred to on the Hill as assessments. I'm not sure what assessments are, but I do know this—that what it results in is that the Agency, the National Weather Service, isn't able to maintain a full complement staff at all its forecast offices.

I understand assessment means something like salary increases, increases in cost, overhead, that type of thing. The moneys are not being allocated for that; the Agency's expected to take it out of hide. And as a result, the Agency is holding back on filling vacancies to maintain themselves in a situation where they can meet their budget deficits that they keep encountering each and every year.

So that's why I hope that the discussion can be broadened upon when you return to Washington——

Mr. VALENTINE. Yes; yes we will.

Mr. KEETER [continuing]. To talk to the other members of the full committee.

Mr. VALENTINE. Yes; yes.

Well, I appreciate the fact that you came forward and if you have anything else that you would like to add, if you would prepare it and send it to me, we will be sure that it gets appropriate attention.

Mr. KEETER. We had anticipated making a written response for the record. We would have agreed to be here early and a more prepared text. But I am here on my day off and——

Mr. VALENTINE. I appreciate that.

Mr. KEETER [continuing]. We just can't really break away that easily.

Mr. VALENTINE. I appreciate that. We had—you know, we had to make decisions as to where to draw the lines and who to invite to this hearing——

Mr. KEETER. Right.

Mr. VALENTINE [continuing]. Because we just had to make certain limitations.

But I understand. I remember that day very well, and——

Mr. KEETER. Right. But, again, thank you very much for having me here and for your interest. I think you have done—the people of eastern North Carolina and the whole State of North Carolina certainly appreciate it.

Mr. VALENTINE. Well, I appreciate you saying that, and I believe so, too. I think that we will—maybe—not just as a result of this hearing alone, but this hearing and others like it, I think that we are going to see some very meaningful changes——

Mr. KEETER. I think so.

Mr. VALENTINE [continuing]. In this area in the near future.

Thank you.

Mr. KEETER. Thank you.

Mr. VALENTINE. I thank all of you. Anybody else?

Well, the—any formalities?

This committee stands—subcommittee, stands adjourned. Thank you all again very much.

[Whereupon, at 3:32 p.m., the subcommittee was adjourned.]

APPENDIX

National Weather Service
Employees Organization
AFFILIATED WITH MEBA AFL-CIO

October 29, 1984

James H. Scheuer, Chairman
House Subcommittee On Natural Resources,
Agriculture Research and Environment
H-2-388 HOB Annex 2
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

On behalf of the National Weather Service Employees Organization (NWSEO), and as NWS forecasters stationed in the Raleigh, North Carolina office, we appreciate this opportunity to comment on the issues raised at the congressional hearing on October 18, 1984 in Rocky Mount, North Carolina regarding tornado prediction and preparedness in the Carolinas during the severe weather of March 28, 1984.

We agree with the July, 1984 NOAA Disaster Survey Report that the paucity of tornado warnings can be attributed to the absence of a full-time warning/preparedness meteorologist and to a less than state-of-the-art radar at the Raleigh Weather Service Forecast Office. Specifically, the Report states (p. 17):

> "The situation in North Carolina is even more critical. North Carolina does not have a dedicated warning/prepardness meteorologist. The South Carolina warning/prepardness meteorologist is only able to make two to four trips a year to North Carolina. To illustrate the seriousness of the problem, the forecaster at the Raleigh Weather Service Forecast Office, who acts as a focal point for preparedness, had to work the midnight shifts during the 1983 spring awareness week because of staff shortages. In addition to no warning/preparedness meteorologist, Raleigh had staff shortages over the last four years similar to Columbia's. From 1980 through 1984, Raleigh had at least one vacant position; about 40 percent of the time there were two or more vacancies. To complicate matters further, one of the staff members has been occasionally detailed to other offices and one member of the staff is in a work/school program. This takes critical time away from liaison work.

444 NORTH CAPITOL STREET, SUITE 800, WASHINGTON, D.C. 20001

> The problem is compounded because North Carolina is a large and populous state. There is a serious hurricane problem on the coast, and the mountainous areas have a high flash flood potential. Again, spotter networks are lacking because there simply is no time for recruiting, training, and maintaining spotter networks."

The Report focuses on the need to work midnight shifts due to staff shortages. However, in the Department of Commerce's NOAA Fiscal Year 1985 Budget documents submitted to the House and Senate Appropriations Committees in March, 1984, the Department proposed a "Savings of 32 positions and $1,173,000 by reducing staffing at 21 WSFO's during night hours." Raleigh, North Carolina was one of the 21 WSFO's proposed for reduction.

The NOAA Disaster Report (p. 8) describes the severe thunderstorm which occured in eastern North Carolina on March 28, 1984. The storm entered North Carolina at 7:10 p.m. and the last tornado formed about 10:15 p.m in the extreme Northeastern part of the state. Severe Thunderstorm Warnings were in effect that evening. However, in the future, if the NOAA-OMB budget decision-makers had their way, there might not be a full compliment of professional NWS employees on duty at night in the Raleigh, North Carolina station.

We support the following 1984 NOAA Disaster Survey recommendation (p. 2):

> "The staffs of both [the North Carolina and South Carolina] Weather Service Forecast Offices should be augmented as soon as possible to ensure an effective National Weather Service-community warning program throughout the Carolinas. A dedicated warning/preparedness meteorologist would give essential focus to the program at Raleigh. With full staffing, the warning/preparedness meteorologists, as well as other members of the staff, including the meteorologists in charge, could devote the time needed in the distant counties."

It is hoped that your Subcommittee will provide oversight, and the House and Senate Appropriations Committees will provide the necessary funds, to implement the reports recommendations in this area. We believe that such increased authorizations would make it possible to implement the other recommendations made in the July 1984 NOAA Disaster Survey Report, including the establishment of severe weather spotter networks, improvement of internal and external communications and additional back-up communications, and improvement and promotion of the use of the NOAA Weather Radio system.

We also encourage the NWS to continue its efforts to replace the outdated weather radars across the nation with the state-of-the-art doppler radars which are much more effective in detecting tornadic circulations. Additionally, the type of radar that is at the Raleigh WSFO (5cm local warning radar) does not have the capability to consistently detect tornadic thunderstorms for those areas struck by tornadoes on March 28th (more than 80 miles distant from the radar).

Finding 4 of the Survey Report addresses the failure of North Carolina NOAA Weather Wire Service. We believe that this teletype service, as well as other internal and external NWS communications systems, are antiquated. As described the Survey Report Section entitled "The Forecast", NWS warnings are extremely time perishable. They must be distributed to emergency management authorities and the broadcast media within minutes. The present NWS distribution systems must be upgraded with satellite and voice circuits to augment or totally replace land-based telephone and teletype systems that are so susceptible to the very weather dangers that the NWS is to warn against.

Various speakers at the hearing consistently presented testimony supporting the Survey Report's finding of the need for an additional meteorologist at the Raleigh WSFO. We find it ironic that NOAA has for the past two Fiscal Years attempted to reduce the number of meteorologists at Raleigh as well as 20 other WSFOs across the nation. In so doing, NOAA has ignored the findings of the President's National Advisory Committee on Oceans and Atmosphere (NACOA). In 1982 NACOA concluded that "the effectiveness of the NWS is being hobbled by failure to provide resources and personnel in spite of increasing requirements placed on the agency." Further, the blue-ribbon panel noted that the NWS was at a point where it may not be able to provide the warnings and protection expected of it in outbreaks of severe weather. We are grateful that the Congress has wisely restored the funding to maintain current WSFO staffing levels as well as funding for agricultural and fire weather programs.

However, despite these restorations and the intent of Congress, authorized staffing levels are not being maintained in the NWS. The "serious staff shortage" in the Carolinas described in Finding 1 of the Survey Report is not an anomaly in the NWS. Many NWS offices across the nation have been carrying one or more vacancies. Staffing levels are now lower than those in 1982 when NACDA reported to the President of the failure of the NWS to provide adequate personnel to meet the increasing demands being placed on the agency.

Administrative correspondence to NWS personnel has stated that the large number of vacancies is due to limited funds. The term "assessments" has been used to describe these budgetary problems. Our understanding is that the NWS is forced to hold vacancies in order to have the money to cover a variety of expenses, including administrative charges withheld by DOC and NOAA, cost-of-living pay increases, and inflationary increases in operational costs.

Various NOAA-appointed panels and disaster-survey teams over the years have provided overwhelming evidence that staffing levels within the NWS have reached a critically low point. The Congress has restored funding to maintain current WSFO staffing levels as well as funding for other weather programs. Yet the number of vacancies continue to increase.

We recommend the following points for the Subcommittees review:

1) In light of the President's recent veto of S. 1097 the NOAA Authorization Bill for Fiscal Year 1985, the Subcommittee should reintroduce, and pass the bill in the 99th Congress;

2) A review should be undertaken by the Congress concerning NWS staffing policies, especially as they relate to warning and preparedness meteorologists;

3) The NWS, with the support of the Congress, should install state-of-the-art radars and communications systems to enable the NWS staff to effectively warn the American public to avoid weather disasters; and

4) The Subcommittee should review NOAA implementation of the July 1984 Disaster Survey Report.

We commend Congressman Tim Valentine, and his staff, for assisting in the conducting of a thorough public hearing on October 18, 1984 at Rocky Mount. In addition, we applaud the farsightedness of Dr. Eric D. Schneider, Team Leader for the NOAA July 1984 Disaster Survey Report, and Dr. Elbert W. Friday, Jr., Deputy Assistant Administrator for Weather Services NOAA, for their comments and observations at the hearing.

Sincerely,

Kermit K. Keeter
Michael E. Sabones
Herbert L. White

Herb White
By Herbert L. White

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF THE GEOPHYSICAL SCIENCES
5734 S. ELLIS AVENUE
CHICAGO · ILLINOIS 60637

October 9, 1984

Congressman I. Tim Valentine
1107 Longworth House Office Bldg.
Washington, D.C. 20515

OCT 11 1984

Honorable Congressman Valentine:

The tornado outbreak on March 28 this year certainly changed the tornado risk statistics in the states of North and South Carolina. I thought that these states could be hit by tornadoes some day but their intensities and the damages far exceeded my expectation, based on the nation's tornado statistics available since 1916.

Our tornado research group at the University of Chicago received the initial tornado information from the National Weather Service Offices at Raleigh, North Carolina and Columbia, South Carolina, along with their request to fly over the entire tornado damage area for aerial photography and damage assessment. Assisted by the National Weather Service personnel in these offices, we determined the paths of all 22 tornadoes and classified them according to my six-point tornado scale (F scale). As presented in the enclosed copy of the March 1984 STORM DATA from NOAA, seven storms were F4 (devastating tornado) intensity which could level well-constructed houses and blow apart mobile homes (refer to page 45 of STORM DATA).

I would like to express my appreciation to the National Weather Service Offices. Without their quick and timely information on the rare and extensive tornado damage, we could not have flown effectively over the entire areas of tornadoes which killed 57 persons and injured 1,248 others.

The aerial survey we conducted was funded by the Nuclear Regulatory Commission for the purpose of improving the tornado risk assessment which is necessary in protecting nuclear facilities and power plants.

The purpose of this letter is to inform you that tornadoes could induce the most violent windstorm in the atmosphere even in the Carolinas where most people think that they may not occur. This time, however, nature displayed its might, reminding people that killer tornadoes could strike violently. The new tornado statistics we are now compiling, using the Carolinas tornado data, will provide you with the proper tornado preparedness applicable to your state.

Sincerely yours,

T. Theodore Fujita

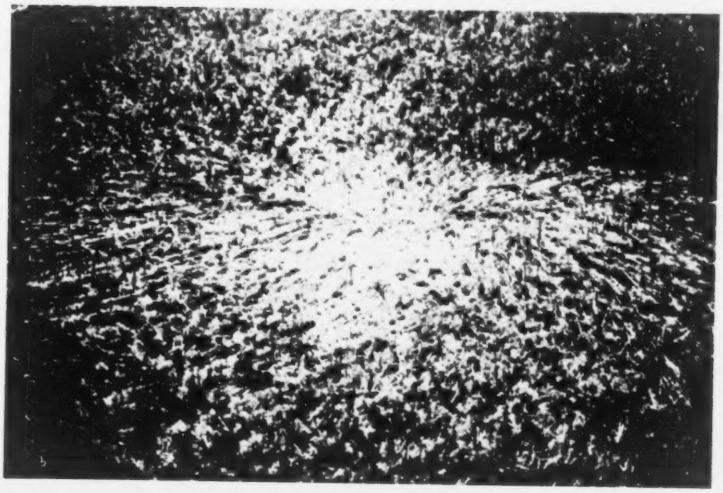
T. Theodore Fujita
Professor of Meteorology
Director of [illegible] Research

Encl.: Storm Data

MARCH 1984 VOLUME 26 NUMBER 3

STORM DATA

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA



"I CERTIFY THAT THIS IS AN OFFICIAL PUBLICATION OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION AND IS COMPILED FROM INFORMATION RECEIVED AT THE NATIONAL CLIMATIC DATA CENTER, ASHEVILLE, N.C. 28801"

L Ray Hoxit
ACTING DIRECTOR
NATIONAL CLIMATIC DATA CENTER

This publication is funded by the
National Oceanic and Atmospheric Administration and the Federal Emergency Management Agency

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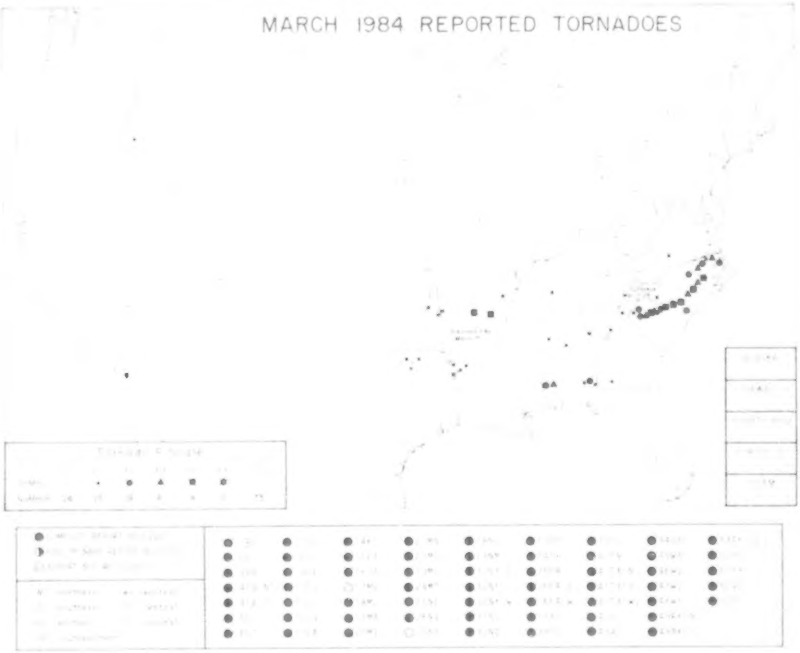
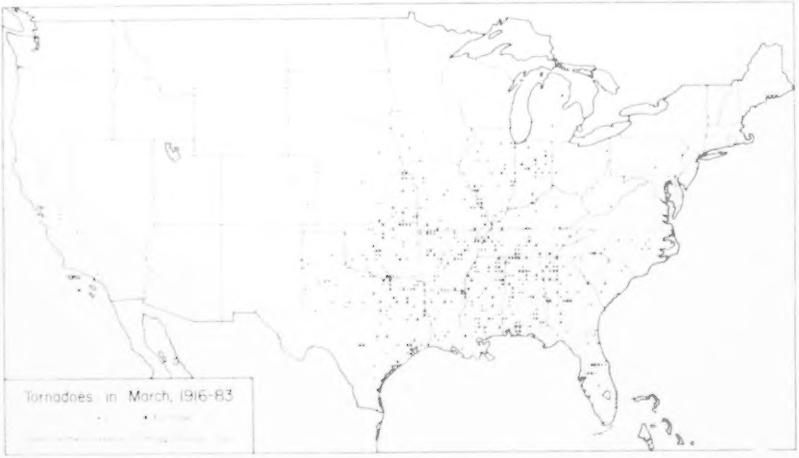
Cover: Trees blown down in a spiral pattern near Faison, North Carolina. The giant spin-up mark, photographed looking southwest on March 31st, was left by the Mount Olive Tornado of March 28th (see Tornado Outbreak in the Carolinas, pages 5-12). ---Photo by Grant W. Goodge, National Climatic Data Center.

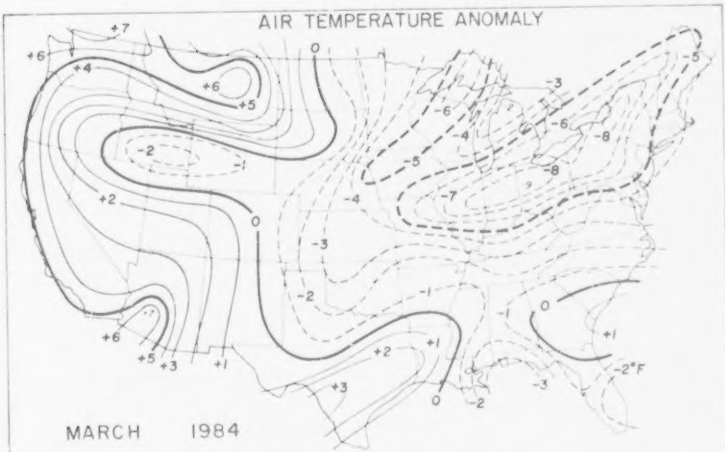
NOTE: The section on Outstanding Storms of the Month is prepared by Professor T. Theodore Fujita, editor, and Duane J. Stiegler, associate editor, University of Chicago. The narrative descriptions of Storms by State and Summaries of Hurricanes and Tropical Storms are prepared by the National Weather Service. The National Climatic Data Center compiles the statistics on deaths, injuries, and damage. This publication contains our best information on Storms, but, due to the difficulties inherent in collection of this type of data, it is not all-inclusive. Late reports and corrections will be carried quarterly.

STORM DATA - (ISSN 0039-1972) is published monthly. Subscription, pricing, and ordering information is available from: Publications Section (E/CC413), The National Climatic Data Center, National Environmental Satellite, Data, and Information Service, NOAA, Federal Building, Asheville, NC 28801-2696.

OUTSTANDING STORMS OF THE MONTH


MARCH 1984 REPORTED TORNADOES


Tornadoes in March, 1916-83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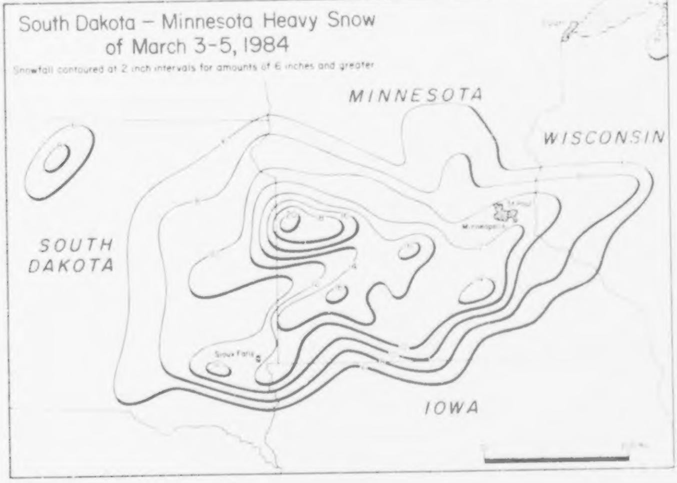
-6
-8
-8
-5
-4
-3
-2
-1
-1
0
+1
-2°F
+6
+5
+3
+1
+2
+1
+3
0
-2
-3
MARCH 1984

---Data base from NOAA/USDA Joint Agricultural Weather Facility.

1. HEAVY SNOW in SOUTH DAKOTA and MINNESOTA on March 3-5, 1984

A snowstorm dropped up to 20 inches of wet, heavy snow over the southern half of Minnesota and extreme eastern South Dakota on March 3rd through the 5th. Strong northwest winds of up to 40 mph accompanied the storm, causing many roads to be closed due to drifting snow. ---Data supplied by NWSFOs at Sioux Falls, South Dakota and Milwaukee, Wisconsin; and by the Minnesota State Climatology Office.


South Dakota – Minnesota Heavy Snow
of March 3-5, 1984
Snowfall contoured at 2 inch intervals for amounts of 6 inches and greater
MINNESOTA
WISCONSIN
SOUTH DAKOTA
IOWA
Minneapolis
Sioux Falls

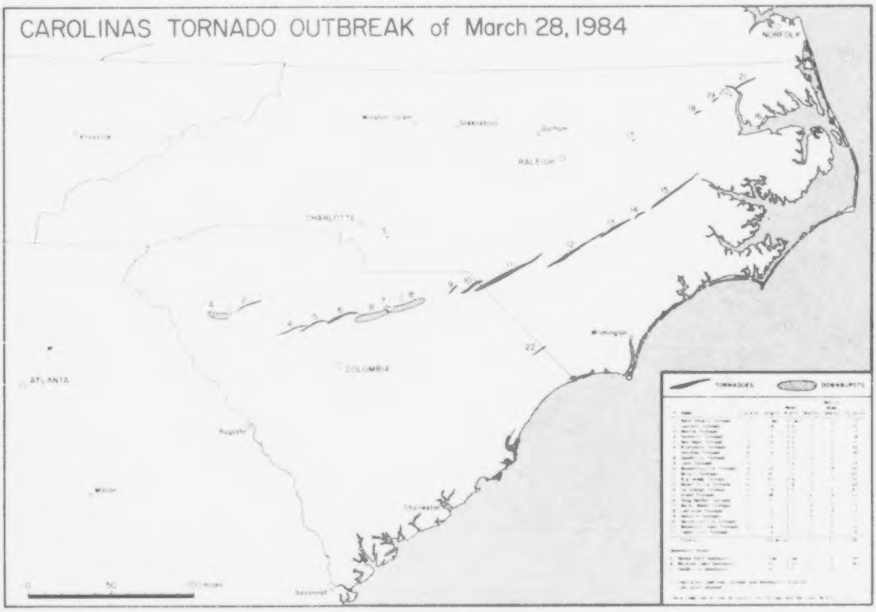
2. LOW PRESSURE SYSTEM over the EASTERN U.S. on March 28-29, 1984

A strong low pressure system intensified over the eastern U.S. on March 28th and 29th producing a wide variety of severe weather throughout the region. The storm was responsible for an outbreak of tornadoes in the Carolinas, strong gusty winds in New England, new all-time, low pressure records for many stations, a microburst in Massachusetts, heavy snow in the mountains of New York and Pennsylvania, and coastal erosion and flooding along the eastern seaboard to name a few. Some of these events are featured on the following pages.

2a. TORNADO OUTBREAK in the CAROLINAS on March 28, 1984

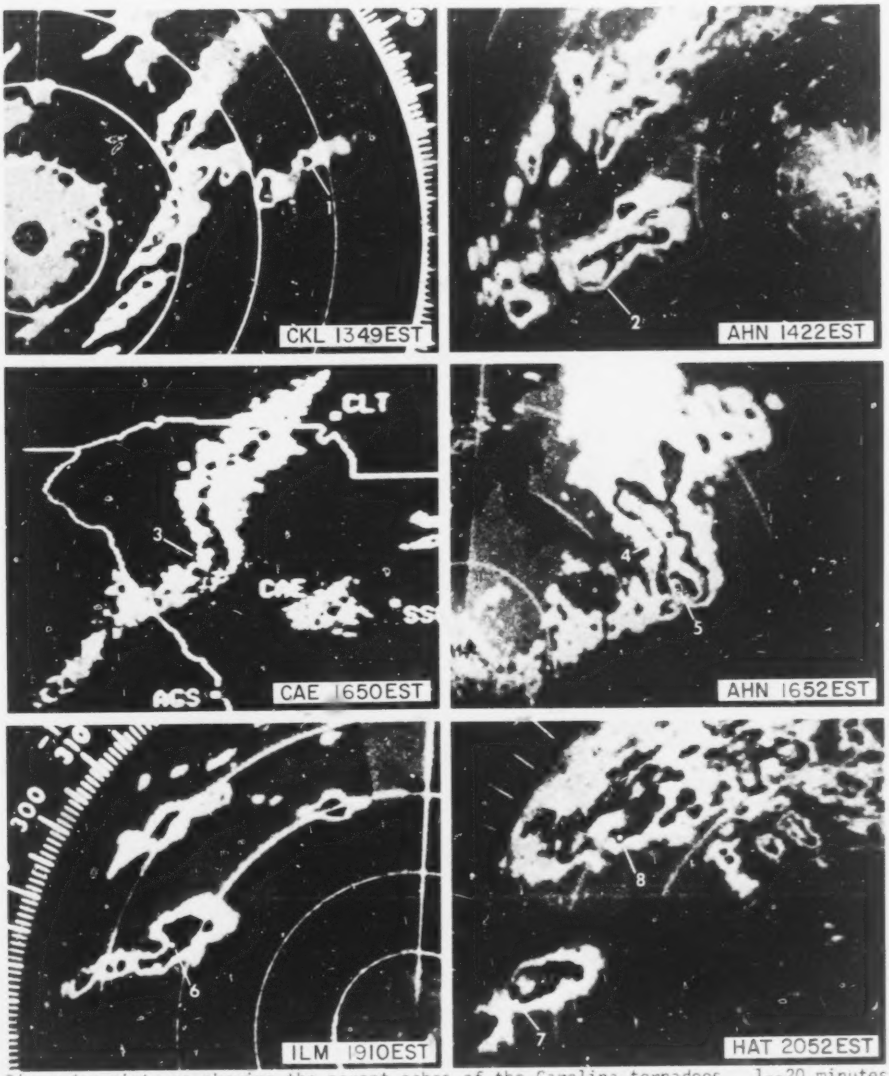
During a 6-hour period in the late afternoon and early evening of March 28th, a strong line of thunderstorms produced 22 tornadoes in North and South Carolina. Of the 22 tornadoes, 7 were F4 in strength, 5 F3, 7 F2, and 3 were F1. The path lengths varied from less than a mile to 45 miles, and totaled 310 miles. The longest tornado path (#11, McColl Tornado) was also the widest, with a mean width of 1.5 miles and maximum width of 2.5 miles. Many of the paths followed each other along lines indicating that the tornadoes were of a family type (spawned one after another by the same parent thunderstorm). One tornado (#16, Snug Harbor) began as a waterspout over Albemarle Sound. In South Carolina the tornadoes were accompanied by 3 large downburst areas, each producing F1 damage.

The total number of deaths for the two states from these tornadoes was 57, 21 of which (37%) occurred in mobile homes. 1,248 people were injured.


CAROLINAS TORNADO OUTBREAK of March 28, 1984

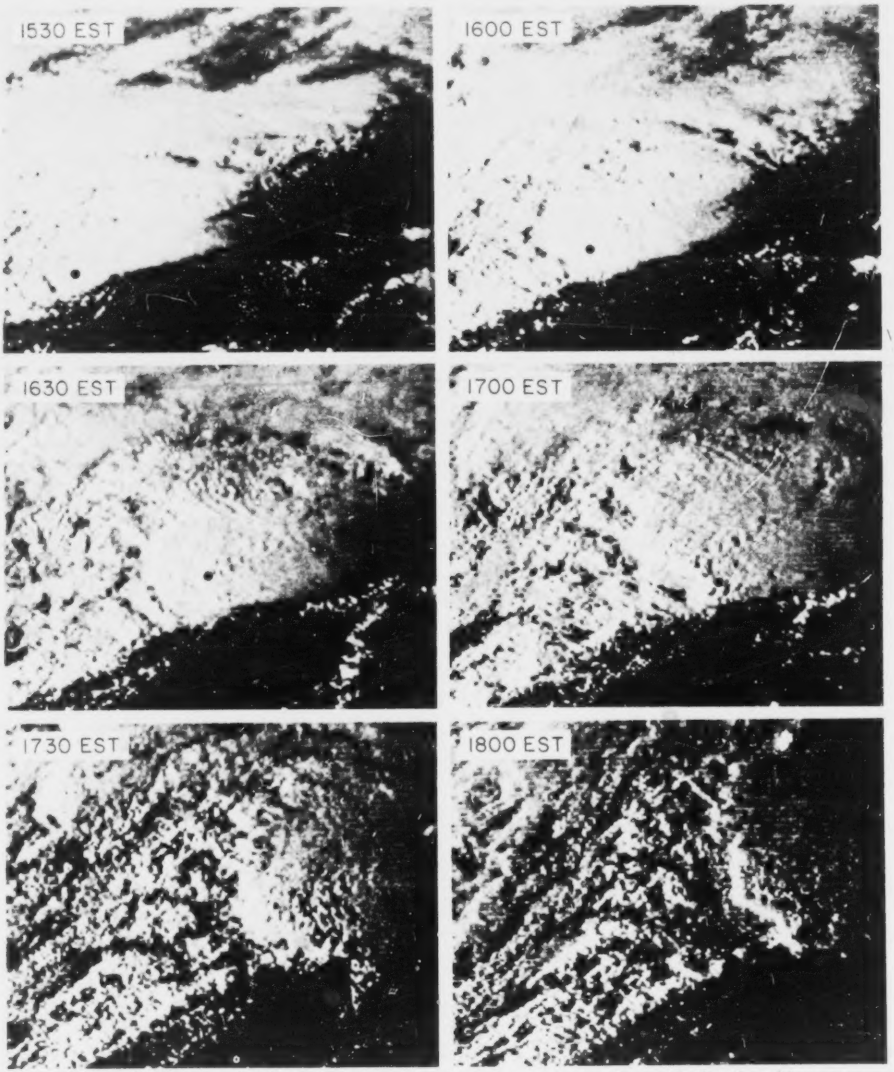
NORFOLK
RALEIGH
CHARLOTTE
COLUMBIA
ATLANTA
Winston-Salem
Greensboro
Durham
Wilmington
Augusta
Charleston
Savannah
TORNADOES
DOWNBURSTS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
0
50
100 miles

TORNADO OUTBREAK in the CAROLINAS ---- continued

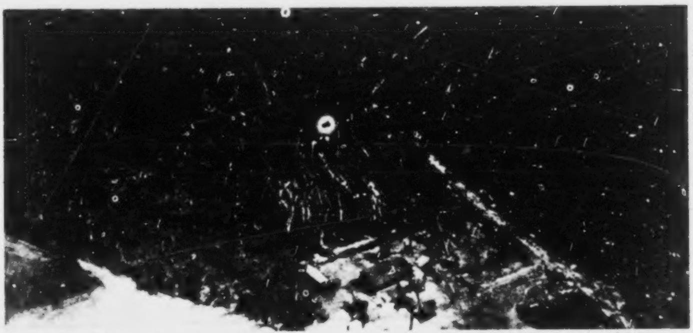

1
CKL 1349EST
2
AHN 1422EST
CLT
3
CAE
SS
ACS
CAE 1650EST
4
5
AHN 1652EST
300
310
6
ILM 1910EST
8
7
HAT 2052EST

Six radar pictures showing the parent echos of the Carolina tornadoes. 1--20 minutes after the first echo, 2--parent echo 28 miles WSW of Atlanta, Ga., 3--bow echo in its mature stage. 4--Laurens tornado on the ground, 5--Newberry tornado formed 10 miles to the east, 6--McColl tornado on the ground, 7--LaGrange tornado on the ground, 8--Lewiston tornado on the ground. ---Photos from National Weather Service radars.

TORNADO OUTBREAK in the CAROLINAS ---- continued

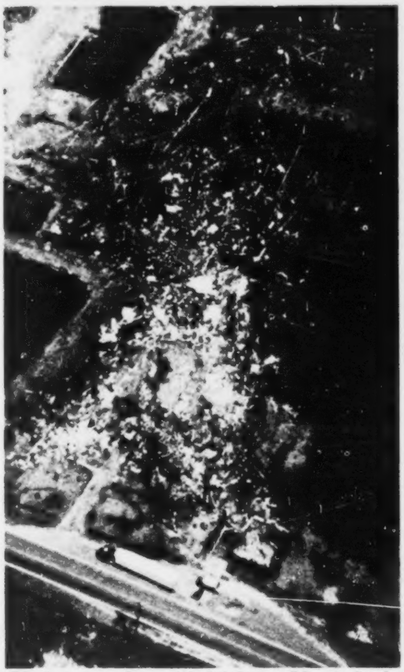

1530 EST
1600 EST
1630 EST
1700 EST
1730 EST
1800 EST

GOES East satellite, visible pictures showing the parent storm of the Carolina tornadoes. 1530EST--Storm is located 10 miles west of Athens, Ga., 1630--20 miles east of Athens, 1630--shortly before the formation of the Ware Shoals tornado, 1700--Newberry tornado on the ground, 1730--Winnsboro tornado on the ground, 1800--Kershaw tornado on the ground. ---Photos by Jim Purdom, NOAA/Colorado State University.

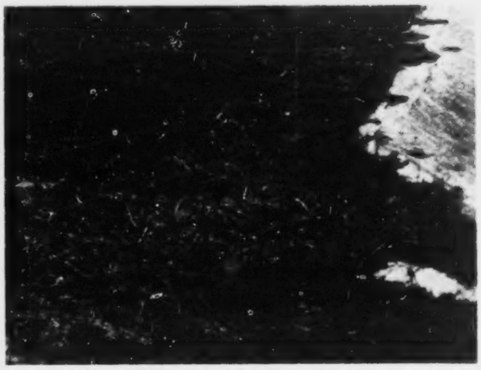


---All damage photos on pages 8 to 12 by Duane J. Stiegler, University of Chicago, except where noted.

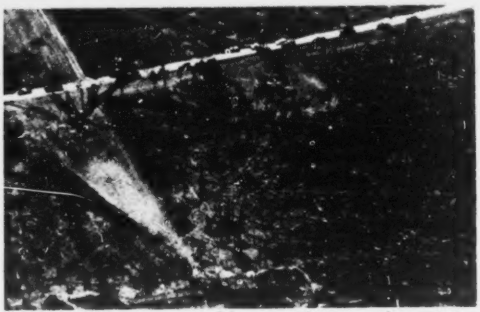
Trees felled in a herringbone pattern by the Cash Tornado (#9 on map) at Cash, SC.



F4 damage along US Highway 52 at Cash. A house and mobile home were thrown from their resting places and reduced to rubble.

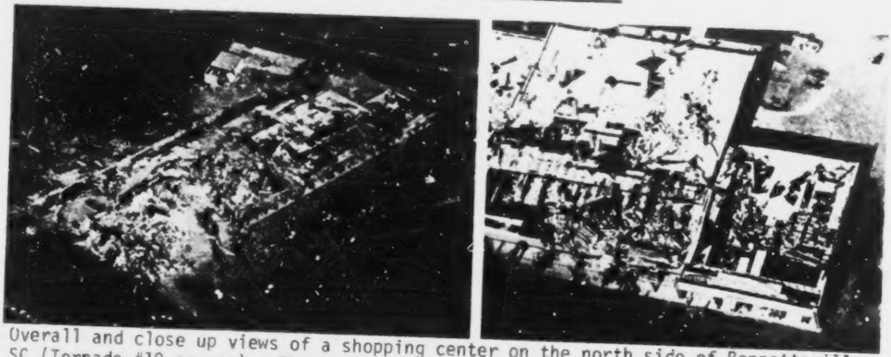


A section of forest where every tree was uprooted or snapped off by the Cash Tornado.



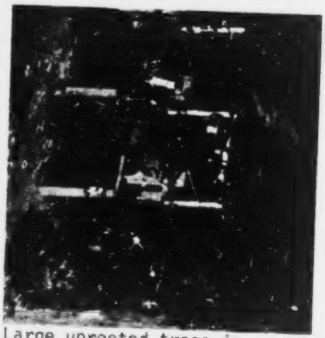
High voltage power lines under repair near Cash.

TORNADO OUTBREAK in the CAROLINAS ---- continued

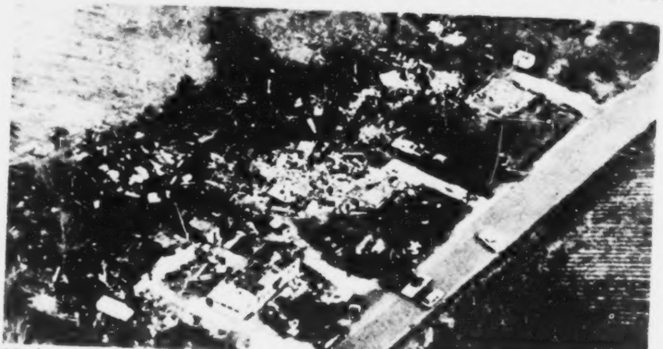


Overall and close up views of a shopping center on the north side of Bennettsville, SC (Tornado #10 on map). The tornado struck the center from the front side.

Two sections of a Bennettsville apartment complex showing 2-story units that had roofs blown off.



Large uprooted trees in a residential area of Bennettsville.



F2 (lower left) to F4 (upper right) damage done by the Bennettsville Tornado along a street at Lester, SC.

TORNADO OUTBREAK in the CAROLINAS ---- continued

A mobile home park in Lester where 4 fatalities associated with the Bennettsville Tornado occurred.

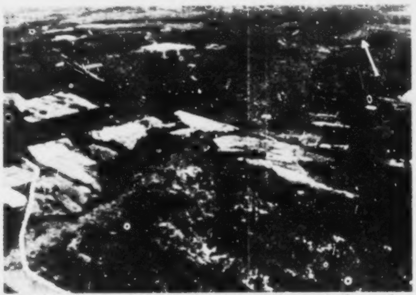
Snapped off trees near Bennettsville.

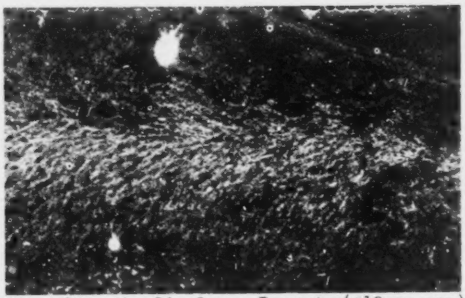
A house near Adamsville, SC that was dismantled by the Bennettsville Tornado.

F3 damage to a frame home along NC Route 53 near the beginning of the Big Swamp Tornado (#12 on map).

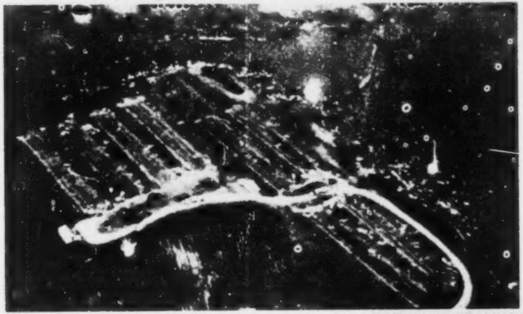
Mobile home park in a weak frame house area on the north edge of Lewiston where all 6 fatalities occurred (#18 on map).

---Both photos above by Jim Purdom, NOAA/Colorado State University.



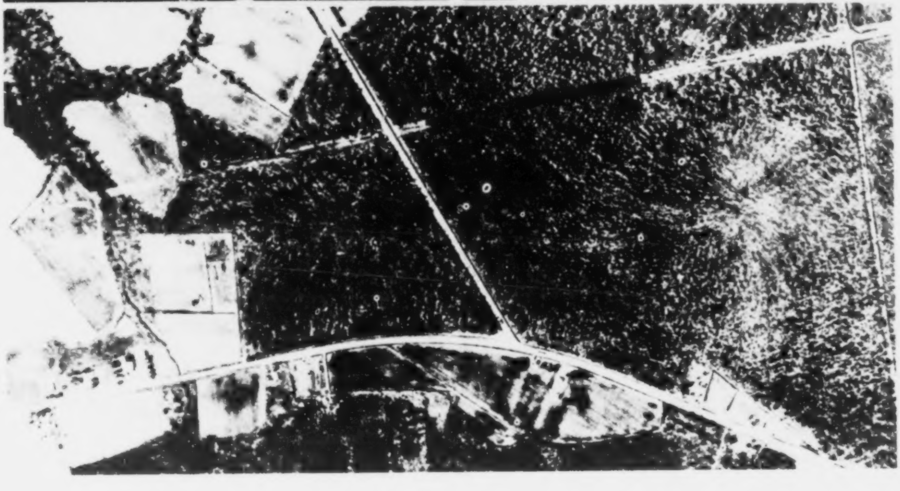


LEFT: The path in this photo, taken 3 weeks after the Big Swamp Tornado (#12 on map), is made visible by the discoloration of dead vegetation. The tornado moved from lower left to top right. RIGHT: Enlargement of the area at the arrow in the left photo.



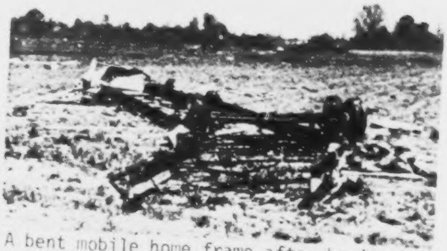
LEFT: A turkey farm near Salemburg, NC where only one small structure remained after the Big Swamp Tornado. ---Photo by James Partacz, University of Chicago.

BELOW: Vertical view of a giant spin-up mark (see cover photo) left by the Mount Olive Tornado (#13 on map) in a forest near Faison, NC. The tornado moved from left to right and spun up at the right edge of the photo. ---Photo by the North Carolina Department of Transportation.

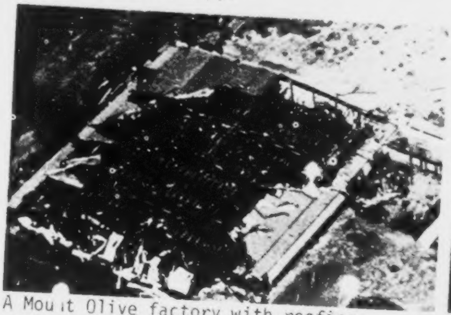


TORNADO OUTBREAK in the CAROLINAS ---- continued

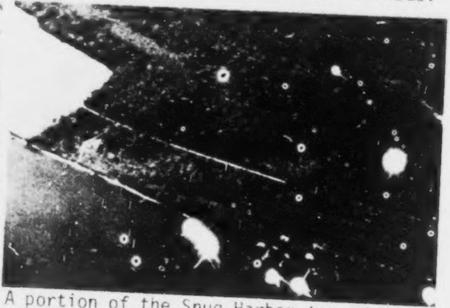
Grain silos crushed by the Mount Olive Tornado (#13 on map).



A bent mobile home frame after having been tossed about by the Mount Olive Tornado.



A Mount Olive factory with roofing peeled off. ---Photo by Brian Waranauskas, University of Chicago.

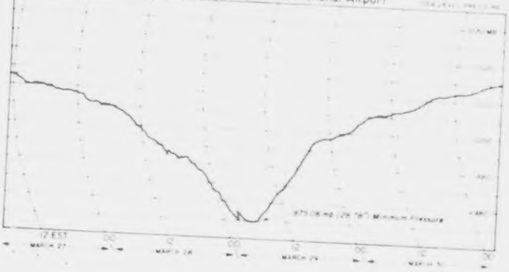


A portion of the Snug Harbor tornado path where it came ashore after starting as a waterspout over Albemarle Sound (#16 on map).

2b. RECORD LOW PRESSURE at BALTIMORE, MD on March 29, 1984

Baltimore-Washington International Airport recorded a new low pressure record for March of 975.06mb or 28.78"Hg on March 29th. ---Barograph trace from NCDC.

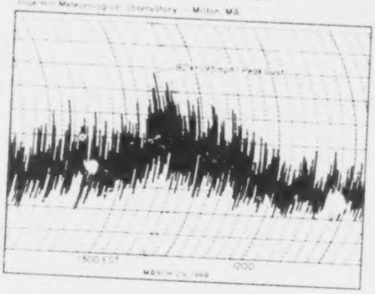
Barograph trace from Baltimore - Washington International Airport



2c. HIGH WINDS at MILTON, MA on March 29, 1984

High winds produced a peak gust of 82kts* (95mph) from the ENE at Blue Hill Observatory near Boston, MA. A second anemometer at the site recorded a 108mph gust. ---Trace from Blue Hill Met. Obs., Milton, MA.

* +4kts correction factor.

Blue Hill Meteorological Observatory - Milton, MA